THE AEROPLANE

Edited by C. Grey

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The AEROPLANE

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ON AERIAL WAR.

Something like a year ago a famous member of the Royal Aero Club remarked casually to a room full of other members that there was one man to whom this country should put up a statue in commemoration of his services to British Aeronautics. He added that he would give everyone in the room two guesses as to the person's name, and that he would bet none of them would guess right, and that when he mentioned the name everyone would agree with him. Pretty well everyone had a guess or two. One suggested General Henderson as having laid the foundations of the R.F.C. Another suggested Mr. Frank McClean because he made it possible for the beginnings of the R.N.A.S. to learn to fly by supplying them with aeroplanes and an aerodrome free of charge. Another suggested Mr. G. B. Cockburn because he taught these same officers to fly. Various other suggestions were made.

Then the originator of the argument made the plain statement that the person who most deserved a grateful memorial was Count von Zeppelin, because he had done more than any one man to awaken the British people to this country's need for an Air Fleet. And the funny part of the incident was that everyone agreed with him.

In a similar way one could doubtless find many to agree that Captain Brandenburg, of the German Feldfliegertruppen, deserves some signal mark of recognition from this country for convincing so many thousands of people that an aerial invasion of enemy territory must be an important part of our war policy in this or any future war.

The British Public was not convinced by Lord Roberts, and British Officialdom was not convinced by Lord Haldane, as to the needs for raising a Citizen Army many millions strong. But both were finally convinced by General von Hindenburg, even before he became a Marshal. The peoples of the British Empire were not convinced as to the usefulness of Imperial Unity by all our oratorical advocates of Imperialism, but they believed quickly enough when the German Emperor showed them what United Germany could do. And so on all the way down the scale, through Grand-Admiral von Tirpitz and his submarines, Germany's heavy artillery commanders, her machine-gun organisers, and everything else. All of which goes to prove once more the truth of the oft-quoted Irish proverb that if you want to put life into an Englishman you have to scare him to death.

When we have done with this war and have as a result the most solid Empire, the finest Army, and the biggest and best Air Fleet in the world, we might do worse than remove those idiotic Landseer lions from Nelson's Pillar and put in their stead statues of the German Emperor who found our Imperial soul for us, of Marshal von Hindenburg who forced us to raise an Army worthy of our position in the world, of Count von Zeppelin who awoke us to the need for an Air Fleet, and of Captain Brandenburg who showed us how it should be used.

I leave the Navy out of the question, because ships will not be worth much in the next war, thanks to armour-piercing bombs and depth-charges; but if anyone is anxious to do so, they can sit a statue of Grand-Admiral von Tirpitz in one of the fountains behind Nelson, where he can keep an eye on the Admiralty and remind it of what Daddy did *not* do in the Great War.

Anyhow, thanks to the late Count von Zeppelin and the very-much-alive-at-the-time-of-writing Captain Brandenburg, we seem at long last to be awaking to the possibilities of aerial war, and, though it may mean reorganising the whole of both Flying Services to do it, I believe we shall be carrying on an air war properly before we have finished with the land war—even if some military genius takes hold of the "tank" idea and uses these weapons as they ought to be used, instead of merely playing with them in much the same way as we played with aircraft for the first year or more of the war.

Steps Forward.

When someone in authority realises that organised bomb attacks with big machines are a serious branch of artillery work, and that "tip and run" air raids with little machines are not, we shall have made one step forward.

When it is recognised that blowing up an ammunition dump in the war area only means more work and wages in Germany, and that blowing up a munition factory destroys still more ammunition and at the same time causes idleness and distress in Germany, we shall have made a step farther forward.

And when we start in earnest to destroy Germany's ammunition supplies at their source instead of waiting till they are moved up into the war area, where they are partly used against our troops before we can destroy them, then we shall have begun to carry on air war in earnest, and our whole Army will be able to take several steps forward.

So long as the British Expeditionary Force has all the reconnaissance and photography and gun-spotting machines it wants, and all the fighting machines it needs to protect them, it can do without bombing machines. Long-range guns can cut railway lines fifteen miles or more behind the fighting line, and can keep them cut, more accurately and more easily and more cheaply than can aeroplanes with bombs. And the bombing machines can do more damage, with greater certainty of hitting their marks, by sticking consistently to hammering German munition areas.

Moreover, organised and constant bomb raids over their munition areas will force the Germans to deplete

their supply of fighting machines in France, much to the advantage of our reconnaissance machines and gun-spotters. And a properly designed bombing aeroplane is quite capable of protecting itself against fighting machines, so that no great force of fighters need be told off to protect the bombers.

It is necessary to remember, also, that even if the whole length of Belgium be taken into consideration, our aerodromes in Flanders are nearer to Germany than the German aerodromes are to any important munition area in England. Furthermore, it is possible by consistent bombing of German aerodromes in Belgium to force the German bombers to move their starting-places farther and farther East, until ultimately it is impossible for them to reach England at all.

A Matter of Organisation.

The carrying of such aerial war to a successful issue is purely a matter of organisation. There are half a dozen men in the Flying Services, whom I could name offhand, who are perfectly capable of organising the whole business if turned onto it, relieved of all other responsibilities and adequately supplied by the Air Board with matériel. Doubtless it sounds a fairly tall order, but it is not half such a difficult job as many other things which are now done as a matter of course, though when they were demanded a year or two years ago we were then told they were impossible. It is nothing like so difficult, for example, as clearing up the Mesopotamia muddle, or withdrawing from Gallipoli, or building railways in France, or producing harmony at the Hotel Cecil.

Born organisers are not so difficult to find, without going outside the Flying Services. The real difficulty seems to be the finding of the men in high places who are capable of finding the said organisers and giving them the necessary power to do their work without interference by jealous or incompetent seniors—as has been proved in Mesopotamia.

Attention at Last.

Anyhow, the whole question of aerial war is now receiving some of the attention which its importance deserves, and the debate in the House of Lords on June 26th shows that it is being taken seriously The account published hereafter is taken from the "Times" newspaper, as Hansard reports of debates in the Upper House do not appear as rapidly as do those of the debates of Commoners, owing to the Peerage preferring to edit its own speeches into a semblance of accuracy. One takes the liberty of interpolating comments on their Lordships' speeches as has been the custom of this paper in debates in the Commons. The "Times" report reads as follows :—

Air Raids and Reprisals.

Lord Strachie asked the Secretary of State for War (1). whether he would consider the necessity of creating a separate department for the aerial defence of London and placing it under the absolute control of experts; (2) whether it was a fact that arrangements for signalling the approach of hostile aircraft were wholly or in large measure directed by a retired superintendent of Indian Police, with temporary naval rank; (3) whether the Secretary of State for War would direct that the sky above east, north-east, and south-east London should be regularly patrolled by aircraft in relays of two hours' duration; (4) whether, inasmuch as effective and immediate reprisals were a certain means of preventing enemy raids, and therefore preserving British life and property, it would not be advisable to order that every enemy raid which proved injurious to the civilian population of this country should be followed by one on a far larger scale, directed against some German town within reach of the Anglo-French lines. He understood that there were six departments concerned with the air defences of London, and it was feared that there was some friction between them. As to aircraft reprisals, if they were carried out on German towns he believed they would be effective, and would bring the realities of war home to the German population, who as yet had suffered but little from it, except in so far as we had cut off food supplies.

[Such an arrangement as Lord Strachie's first question suggests is unthinkable. It would mean creating a London Defence Army with a separate force of aeroplanes, anti-aircraft guns, observation posts, and everything else, apart from Home Forces Command. It would overlap all the provincial defence arrangements, and would cause endless friction and confusion. His second question appears to be merely foolish, because the signalling of hostile aircraft has nothing to do with the Navy, above high-water mark; and, anyhow, there seems no reason why a retired Indian Police officer should not be an excellent man for the work.

The third suggestion, as to continual patrols, is simply futile. No possible patrol could attack an invading force, and the actual defensive aeroplanes would have to start from the ground as usual. Consequently, patrols would merely use up men and machines and petrol to no purpose. The fourth suggestion shows glimmerings of sense; but, like so many other people, Lord Strachie insists on regarding as reprisals those warlike operations which ought to be merely part of the regular work of the Flying Services.]

Lord Sydenham said that there were three matters to which, in his opinion, the Government ought to give careful consideration. The first was the best possible distribution of our Air Forces in this country having regard to the new conditions that had arisen. The second matter was that the conditions prevailing at the Air Stations should be such that every effective machine would be ready to go up at a moment's notice; and that there should be competent authorities always on the spot to give orders for the machines to ascend. Lastly, there should be a carefully organised observation system with centres from which warnings could be distributed to Air Stations and gun stations.

A difference of opinion prevailed about the giving of warnings to the civil population. Anyone who was in the City at the last raid, as he was, could not help observing that there was a general tendency on the part of the public to go out into the streets or upon the roofs in order to see what was happening. In some offices, however, the staffs were directed to go down to the basements. Everyone should have the chance of doing that. It seemed to him that it should have been possible to give at least half-an-hour's warning of the raid, even after the direction of the enemy aeroplanes was determined.

He was against reprisals in kind, and thought that if they were avoided our descendants would be thankful that we had not lowered ourselves to the level of the Germans. (Hear, hear.) Besides, reprisals in kind would involve a considerable limitation to the proper and more effective work of our aviators at the front. If the public were better informed by the Government as to the result of these tactics they would be more satisfied, and their erroneous conclusion that while the Germans were attacking us we were doing nothing would be removed.

[As always, Lord Sydenham's observations deserve careful consideration. Very probably by now the "best possible distribution of our air forces in this country" has been made, or is in the making. As to having machines ready to go up at a moment's notice, it may be remembered that a year or so ago it was pointed out in this paper that defensive aeroplanes should take no longer to start than it takes to turn out a fire-engine. Whether machines do turn out so quickly or not depends on the officer commanding each station. I happen to know personally of at least one station which on the occasion of a recent warning had its fighting machines actually in the air in time which would have done credit to a fire station.

Such rapidity means keeping pilots in turn on the spot for a certain period every day. It may be worth while here to point out that each pilot must have his own machine, and must not be allowed to dash out in a fit of enthusiasm and seize the first machine he sees ready to start. He may be depriving a better pilot of the machine to which he is most accustomed, and may thus decrease the fighting value of that particular unit.

As regards the observation system and the distribution of warnings, one hopes that Lord Sydenham has since been shown the working of the system now in operation. As a machine, it appears to be singularly efficient, and its weakness is merely the fallibility of its individual human elements, which can only be discovered in the process of operation, and eradicated when found.

The question of warnings is most difficult, as has been demonstrated frequently of late. It is even doubtful whether it is wise to go down into basements, in view of the result officially notified in the Poplar case, where 26 children were killed on the ground floor, and only one on each of two floors above. It would seem probable that the Germans are now using the equivalent of an armour-piercing shell, with great penetrating power and a delay-action fuse, so that more damage is done on the ground level than upstairs. Where there are many floors above and a heavily vaulted cellar—as in some banks—the cellar might be the best place, but most modern houses have only an ordinary wooden floor over the cellar, and, in such a case, the cellar would be the worst possible refuge. On the whole, it seems that warnings should not be given broadcast, but only to responsible people,

such as the fire brigade and police, so that they may prepare for their special duties, and to heads of big firms, so that they may get fire-extinguishing apparatus ready, and take steps to allay panic among their employees when a raid arrives, as, for example, in preventing women workers from crushing one another to death on staircases and so forth.

On the subject of reprisals generally, one agrees with Lord Sydenham. Where there are so many legitimate targets, such as munition works and their surroundings, within reach, we should do little material harm to the enemy and some moral harm to ourselves by bombing mere country villages or health resorts. The bomb which is alleged to have exploded in a circus full of people, including many women and children, at Freiburg, would have been of more use if it had fallen into a blast furnace or a busy machine-shop.]

The Marquess of Crewe said he knew something of the observation system established in London and its neighbourhood, and could say that so far as the giving of early warning of impending raids was concerned it had been most successful. In the opinion of the London Fire Brigade the early warning of fires resulting from raids could not be more effectively given by any other system than that which existed at present. It appeared to him to be a mistake to take reprisals in this connection. What ought to be done, and so far as he knew was being done, was to see that our aviators inflicted the utmost possible military damage on the enemy.

[Lord Crewe has evidently familiarised himself with recent developments, and the only question at issue is whether still more military damage cannot be done to the enemy by organising big attacks on his sources of munition supply.]

Lord Knaresborough said he had within the last few weeks made it his special business to inquire of everybody he knew their opinions on this question, he would not call it reprisals, but of hitting back as hard as we could the Germans from the air. He found the general opinion was that the German population inside Germany had been treated like spoilt children during the war. The German population knew this and chuckled, and said we were too silly to treat them as they treated us. He said, Hit back as hard as ever you can. He believed 19 out of every 20 people were of the same opinion.

[Lord Knaresborough's demand that we shall hit back as hard as we can is entirely reasonable, provided that we hit efficiently and in the right spot. It is no use hitting a nigger's head, but one can do good trade by hacking his shins. Similarly, hitting the heart of Germany's army—its sources of supply—is probably better than merely hammering the firing line.]

The Case of the Hospitals.

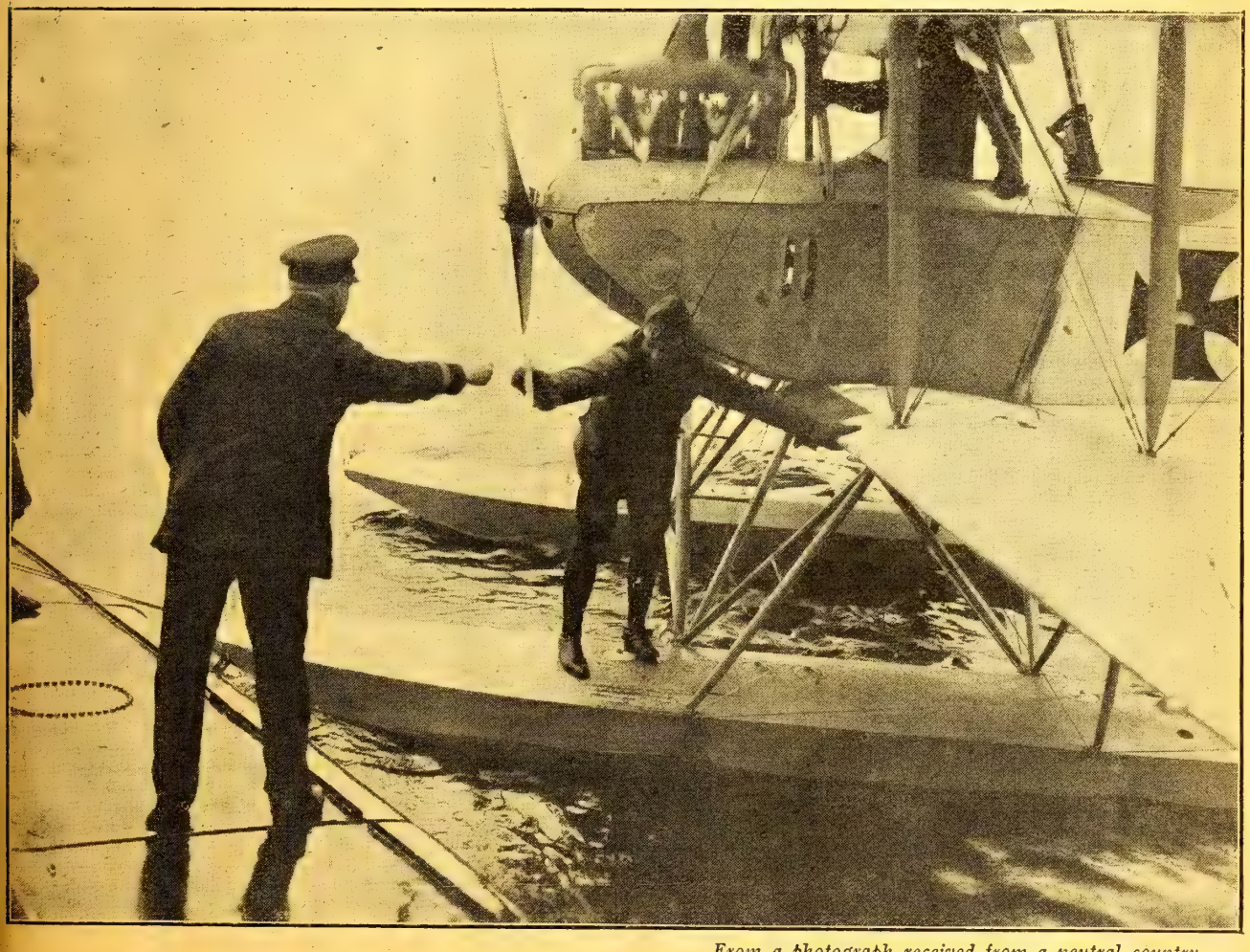
Viscount Knutsford insisted on the importance of warnings being given of the approach of air raids in the interests of the London hospitals. In those institutions there was an enormous amount of work to be done when these air raids took place. When a hospital dealing with 80 persons brought in every hour suddenly found it had to deal with 270 cases arriving in half an hour it was quite impossible to attend to the wounded unless those at the head of affairs gave them sufficient warning.

Having witnessed the most awful sights he had ever seen in his life, he should like to feel sure that London was as well protected as it ought to be. With regard to reprisals, however, he did not believe that any man who had seen women and children injured and torn to pieces, as he had, would ever dare to say that England should be guilty of such a crime. (Cheers.)

[The point about warning the hospitals is well worth attention, and arrangements have now probably been made to this end. As to the protection of London, it is really no more important that London should be protected than that Folkestone, or Southend, or Billericay, or the Isle of Dogs should be protected. It is England, as a whole, which needs protection. The place where the protection of England should take place is in Germany. The British Army is in France on its way to Germany for that purpose, and a properly organised Air Fleet can get there before the Army.]

The Reply of the Government.

The Earl of Derby, dealing first with the specific questions of Lord Strachie, said:—The answer to the first question is in the negative. The defence of London against aircraft is and must be part and parcel of the defence of the kingdom as a whole. (Hear, hear.) It is under the direction of Field-Marshal Lord French, in whom the Government have every confidence, which, I believe, is shared by the country. He is assisted by a senior expert officer of the Royal Flying Corps, and it is the business of the War Office and the Air Board to give them all the aircraft



From a photograph received from a neutral country.

The pilot of a Hun seaplane handing orders to the skipper of a submarine. The engine of the seaplane is a Benz.

they may require. But do not let it be supposed for one minute I am saying they get all they would like, or anything approximately equal to the aircraft they would use if they had them. It has to be an adjustment, and this is most carefully thought out, between the demands of the various theatres of war. While we are endeavouring to do all we can to meet Lord French's demands, we cannot meet them all, and you are going to do exactly what the Germans want if you deprive your battle front of aeroplanes in order to lock them up against raids which may never come off. You have to study all the theatres of war and to adjust your supply of machines so as to meet, as far as possible, the requirements in each of those theatres. As regards the noble lord's second question, the officer in question—I am sorry that the innuendo should be directed against him that he is not a man to whom this duty should be entrusted—is an officer who has done extraordinarily good work, chiefly in the direction of warning fire brigade stations of the outbreak of fires.

As to the patrolling of the country by aircraft in relays of two hours' duration, I have to say that whatever the steps the authorities may take, the last thing I should do would be to give any information on the subject to the enemy. Any such steps ought to be kept as secret as possible. (Hear, hear.)

The Question of Reprisals.

With regard to the question of what are called reprisals, there is one point which is not sufficiently known, or, at all events, fully recognised. I allude to the amount of bombing behind the enemy's lines done day in and day out by our aviators. (Cheers.) I have the authority of the head of the Flying Corps in France for saying that for every bomb dropped behind our lines we dropped a hundred behind theirs. That bombing is done with a distinct military object and objective, and I venture to say that the whole country will associate itself with the view that we are not going to try to imitate the German in his brutality, and that the idea of an eye for an eye and a tooth for a tooth in the way of massacring women and children is absolutely repugnant to this nation. (Cheers.)

In any question of reprisals we must have a distinct military objective, something by which we can achieve not only the killing of soldiers, but the destruction of munition works and factories for the construction of guns.

More Aeroplanes Wanted.

I would say that the number of aeroplanes that any nation has is not equal to its demand, and, therefore, that what you have to do is to try first of all to meet that demand as far as possible. The Air Board is doing wonders in this direction, and surely the least thing we can do is not to tie the hands of the military authorities as to the best use they can make of their machines, but to give them the fullest power to use their machines in whatever way they think they can be best used for the purpose of bringing the war to a successful conclusion.

I am not one of those who wish to see this war carried on with kid gloves—we have got to hit back, but let the military authorities decide what is the best way of hitting back, and I can assure the House that the Government has given an absolutely free hand to the military authorities to use their air machines in whatever way they think best to secure military success.

There is not a day passes in which something fresh is not devised with a view to secure greater safety in this country. I can assure the House that at the present moment there is the closest possible co-operation between the Army and the Navy in these matters, and that steps are being taken by both departments to secure not only protection against enemy aeroplanes, but also to provide all the means of observation which are so necessary in order that our aircraft may be up in the air before an enemy force arrives.

As to the defence of Paris, it should be noted that the conditions there were entirely different. The German aeroplanes to approach Paris had to fly over the French lines, while they had nothing of that kind to do here.

Cock-and-Bull Story.

As regards the suggestion that some of our aeroplanes are flown by Germans, this is the first I have heard of it, and I should have heard of it if there were the least truth in the story. I may say also that there is not the least foundation for the statement that there has been an agreement between ourselves and the Germans not to shell villages far behind the lines. Do not pay attention to all these cock-and-bull stories. Everything that possibly can be done is being done at the present moment to defend not only London, but the whole kingdom against aircraft.

There is one further question, that, namely, of giving warning. I do not know a more debatable subject, and I cannot myself make up my mind as to what is the right and best thing to do. There are strong arguments both for and against warnings. But at a conference held only yesterday, when the best military, naval, and civil authorities were present, there was a consensus of opinion that the giving of warning might do more harm than good. I agree that it might be possible in certain circumstances, which we will consider, to warn hospitals, but there may be a great risk that the cry of "Wolf!" will be heard too often, and, therefore, that, in the end, there might be more danger and perhaps less preparation to meet it than at the present time. In concluding, I ask your Lordships to remember that the needs of our battle fronts must come first, and that we should only be playing into the hands of the Germans if we kept our aeroplanes here instead of distributing them where they can do more good in fighting the Germans in the areas of war. (Hear, hear.)

[On the whole, Lord Derby's reply is entirely adequate and satisfactory. On the question of reprisals, however, one would again point out that even if we do drop a hundred bombs behind the enemy's lines for every one dropped behind our lines, those hundred bombs are, presumably, merely making holes in France or Belgium, and so are doing no harm to Germany, and they are not having the slightest moral effect on the German people. One is glad, therefore, to see the remark that "in any question of reprisals" we must achieve "the destruction of munition works and factories." It suggests that something may be done about it.

The argument that Paris is protected by the fact that raiders have to fly over the fighting line is the proper reply to those who imagine that the alleged aeroplane patrol over Paris is what protects that city. Returning raiders would be met by the pick of the French *avions de chasse* from the aerodromes at the front. Similarly raiders returning from England have twice been met by some of our best fighting pilots from Dunkirk. So far it seems the London raiders were not so met, and still more curiously nobody has asked the Admiralty for an explanation, for this is no affair of the R.F.C.

If patrols are at all necessary, it is easier to patrol from Nieuport to the Dutch frontier than from Harwich to Dungeness, or even from St. Albans to Croydon, via Dartford, and if the Flanders patrol missed the outgoing invaders they could catch them on the way back. Perhaps the Vice-Admiral Commanding Dover Patrol will kindly arrange accordingly.

Finally, one quite agrees that the needs of our battle fronts must come first. And the best way to help the battle front is to destroy the enemy's sources of supply. Certainly we must not waste trained fighting pilots and first-class fighting machines by keeping them in this country waiting for raids which may only arrive once a month or so.]

The Earl of Selborne thanked the noble earl for what the House felt was a most admirable speech.

Lord Montagu's Warning.

Lord Montagu regretted that we had not got enough aeroplanes for all the work we had to do. We were using our best aircraft at the front, and the relative values of the kinds of work to which it was put could only be decided by the military authorities.

We must look forward to air raids becoming more frequent and more serious. The last air raid resulted in a casualty list of close on 600. Possibly this year, and almost certainly next year, we must expect a repetition of such raids; and if the casualties ran up to thousands, as they might easily do, the Government would be compelled to take a much graver notice of them.

It was absolute humbug to talk of London being an undefended city. The Germans had a perfect right to raid London. London was defended by guns and aeroplanes, and it was the chief centre of the production of munitions. We were, therefore, but deluding ourselves in talking about London being an undefended city and about the Germans in attacking it being guilty of an act unworthy of a civilised nation. That might be an unpopular thing to say at the moment, but it was the actual fact of the situation.

The right line for the Government to take was to say to the civil population:—"This is a war of nations and not alone of armies, and you must endeavour to bear the casualties you suffer in the same way as the French and Belgian civil populations are bearing the casualties incidental to this kind of warfare."

Those of them who knew the situation knew that London could not be protected from attack at the present time, and it would be better for the Government frankly to tell the people so. The proper policy in regard to the uses of our Flying Corps was that which was being followed by the War Cabinet, that of keeping our best men and machines at the front. The need was for more aeroplanes.

What was wanted was not a separate authority for the defence of London, but some one placed in supreme command of the whole Air Service. Every hour of the war showed the necessity of greater energy in the prosecution of the campaign by air. At the opening of the war the employment of air machines was thought to be a subsidiary issue. It was going to be the paramount issue before the end. Everything must be subordinate to the manufacture of aeroplanes.

[Lord Montagu's speech is certainly one of the soundest ever uttered on the question of aerial war. None can disagree with

a word of it. He disposes finally of the favourite English hypocrisy as to London being an undefended city, and the phrase "the Germans had a perfect right to raid London," only shows once more the intellectual honesty of the House of Lords.

His warning that we must expect bigger air raids is very necessary. Three German raids have reached this country and have got away with slight losses. As a result, at least 50 German pilots now know their way to London by air—for when once they reach the Thames they cannot go wrong. Many of their machines were three seaters, so there may be as many as 70 or 80 pilots who have made the trip to the Thames. There is, therefore, little to prevent them from sending a fleet of 75 to 100 machines over on the next fine and clear moonlight night and doing really serious damage. The little that can be done to prevent such a raid depends on what the High Command thinks fit to do in the way of making it impossible to concentrate such a fleet in Flanders.

The real reply to the whole question and to this whole debate is Lord Montagu's dictum that "Everything must be subordinate to the manufacture of aeroplanes." Given enough aeroplanes, and assuming that they are properly handled, we can not only stop the invasion of England, but we can carry such an invasion into Germany as to deprive her armies of their supplies of munitions, to demoralise entirely her population of munition workers, and to force her to make peace on our terms.

It is purely a question of organisation, first of all at home, as concerns supplies, and secondly in the field, as concerns operations. For both purposes we have excellent men in important positions, General Brancker at home and General Trenchard in the field. If they are given a free hand, unhampered by inimical influences, and if they are loyally served by their subordinates—and if they can get rid of some of their inefficient and ineffective assistants—there is no reason why they two should not be the chief instruments in stopping the war.—C. G. G.]

THE INVASIONS OF ENGLAND.

According to the "Daily Mail" of June 29th, arrangements have been made by the Ministry of Munitions to give warning of the approach of enemy aeroplanes, and for the evacuation of the two upper floors. Similar provision is apparently made for the employees of the War Office and the Home Office.

If this report be correct, it strikes one that an organised desertion of official posts of duty, by persons who flatter themselves that they are on "war work," is playing into the hands of the enemy, and is setting but a poor example to the common people. And, anyhow, with the new German bombs, the top floor is about the safest place, as the results at the Poplar School demonstrate.

THE LONDON AIR RAID.

A Berlin semi-official telegram of June 28th says:—

The grief in Germany is not less than the grief in Great Britain that in the last air attack for military objects on London civilians, especially children, fell victims.

It has occurred to nobody in Germany to regard the death of these children as a justifiable reprisal for the hundreds of children who fell victims in the air raids on Karlsruhe, Freiburg, and Treves.

THE QUESTION OF REPRISALS.

Speaking at Birmingham on June 28th Mr. Kellaway, Parliamentary Secretary to the Ministry of Munitions, said demands for an immensely increased output of aeroplanes to prevent daylight raids on our towns and villages were now being made. "If I may express my own personal view," he added, "I believe that if we could systematically and immediately raid German towns every time that a raid was made on British towns and villages the public opinion of Germany would very speedily compel the German Government to abandon this senseless and brutal form of warfare. If the British Army possessed sufficient aeroplanes for all purposes on the Western front and for protective purpose at home, and had any to spare for raiding German towns, then I for my part would not hesitate to use aeroplanes for this purpose, and I believe that the conscience of the civilised world would justify us in doing so. (Cheers.) But it is quite obviously a case of having available a practically unlimited supply of aircraft, and that unlimited supply we do not, in fact, possess. To provide it we have to increase the available supply of certain classes of skilled labour."

AIR RAID WARNINGS.

The Lord Mayor has received the following letter from the Home Secretary:

Home Office, June 29th, 1917.

Dear Lord Mayor,—With reference to the interview which we had on the subject of public warnings of air raids in London, and the subsequent conference with yourself and some of the mayors, I think it right to inform you that the whole question has been brought before the Cabinet, and after very careful consideration of the advantages and disadvantages of the proposal, the Cabinet decided that it is not desirable in the public interest, in present circumstances, that public warnings of air raids should be given in London. As you were good enough to inform me that you were willing to leave the matter to the decision of the Government, and to abide by their decision, I thought you would like to learn from me the conclusion at which they have arrived.—Yours truly,

George Cave.

OPENINGS FOR INVALIDED OFFICERS.

Gentlemen who have served as Officers in the Navy and Army, and who, for reasons of health, are unable to take up active service again, but who are sufficiently fit to accept useful and profitable employment in a tropical country, should communicate with the General Secretary of the Navy League, 13, Victoria Street, S.W.1.

THE SURVIVORS OF L.48.

The "Daily Mail" of June 29th says:—

Aviators are wondering why the Germans in reporting the destruction of Zeppelin 48, which was brought down in flames in an East Anglia village on June 17th, stated that the airship was under the command of Captain Victor Schütze, and that "the whole crew and the commander above-mentioned met the deaths of heroes."

The commander was not Schütze, but Captain-Lieutenant Eichler, 40 years of age, a clever pilot who was much "wanted" by the British aviators, and had taken part in several raids. Ample evidence was forthcoming at the inquest on the 20th to place him among the four men whom the military were able to bury in the afternoon of that day under their own names.

There are three survivors of the wreck. One is Lieutenant Mieth, the second in command, and the two others are warrant officers. They were three of the eight who jumped clear of the blazing airship, most of them being gathered in the fore part, which, as the airship took barely a minute and a half to come to earth, escaped the flames to the last moment.

Mieth broke both legs, and one of the warrant officers had a leg broken and other injuries. Both are in hospital in an eastern county. Mieth told a nurse there that he now believes in the English maxim that thirteen is an unlucky number. His last was his thirteenth air visit to England.

The third survivor, who received no injury whatever with the exception of a bruise behind the ear, is a military prisoner. This is the man who stated that he used some device inside his overcoat to make a crude parachute and check his fall.

Commenting on the destruction of this Zeppelin in East Anglia, the "Journal" (Paris, June 18th) says:—

This shows once more the remarkable mastery which our Allies have obtained in the air. It is to be observed that, with a single exception, all the recent excursions of Zeppelins over England have resulted disastrously. This brings to 23 the number of Zeppelins whose destruction has been ascertained in an absolutely certain manner since the beginning of hostilities. Of this number 12 were destroyed in the year 1916.

COPPER TUBE SPECIFICATIONS.

It will be remembered that a week or two ago a list of standardised sizes in copper tubing was issued by the Air Board and reproduced in this paper. It was then stated that detail specifications as to quality of copper and so forth would be issued at an early date. This full specification has now been issued, and though it is not advisable to reproduce it in full herewith, owing to the possibility of it being of use to the enemy, copies of the specification can be obtained by the authorised officials of firms constructing aircraft.

All heads of departments using copper tube should make a point of familiarising themselves with this specification, and any who have not received a copy should ascertain from their office whether this specification has been received, as it is unfortunately a fact that important official documents occasionally fall into the hands of departments in large firms, which departments are not immediately interested in those documents, and yet fail to pass those documents onto the proper departments.

Works' managers, works' foremen, and others in similar positions, may obtain copies from the Air Board, Strand, W.C.

Tubing 2½ in. by 20 gauge has been added to the standard sizes.

A WILL.

Mr. Horace Leonard Short, of Eastchurch, Kent, who died on April 6th last, left property of the value of £69,565 gross, with net personalty £59,770. The will, dated September 16th last, is proved by his brothers, Albert Eustace Short, of West Hampstead, and Hugh Oswald Short, of the Seaplane Works, Rochester, aeroplane manufacturers. Subject to a legacy of £1,200 to his wife, the testator leaves all the property in trust for her and his children.

CONCERNING PISTOLS.

BY "BERKELEY."

The Book of the Pistol and Revolver. By Captain H. B. C. Pollard. (McBride, Nast & Co., Ltd., 2, Breams Buildings, E.C. Pp. viii+230. Illustrated. 10s. 6d. net.)

Since the days of the first Mesopotamian scandal, when our earliest ancestors regretfully passed from the placidity of a garden to the endless worries of a workaday world, the ultimate settlement of quarrels has been almost invariably by hand-to-hand conflict. The arbalist, the sling, the bow, the cannon, the musket, and the rifle have each been produced that death might be transmitted by human agency through space. But none of these has destroyed the primeval joy of a personal struggle at close quarters for the elimination of the weakest or the most unwary. In such contests the pistol shares the glory with the sword, the mace, the lance, and the bayonet. Its importance as a weapon of daily warfare is increasing, and a book on its history and use is opportune.

The pistol was first produced as a substitute for the cumbrous arquebus that horsemen might carry firearms as a part of their equipment. Moreover, the pistol, even in those earlier days, was small enough and light enough to be carried at all times by those who felt that self-protection was a primary virtue of life. Its early uncertainty was no great drawback when used for protection, provided no premature attempt to fire was made. The assailant was often deterred by the knowledge that the pistol might not misfire.

To-day a pistol or revolver is an essential part of an officer's equipment. Even the aviator, armed as his machine is by the latest pattern of machine gun, finds the pistol of great value. In the early days of the war, many aerial combats took place between pilots armed only with revolvers, and it is stated that in recent times an observer whose machine gun jammed brought down his enemy with a Mauser automatic pistol. A rifle is too cumbrous to be carried with ease in the average aeroplane used for fighting purposes, but there is no difficulty in stowing away a pistol.

The first seventy-three pages of Captain Pollard's book are set aside for a brief history of the pistol and revolver from the end of the fifteenth century, the period of its invention, to the present day. In Chapter III he treats of the "wheel-lock," introduced in 1515 as an advance in design on the clumsy and uncertain match-lock. In it was used "a notched steel disc, revolving at high speed against a stationary flint or fragment of iron pyrites to produce a stream of sparks in the flash-pan." "This disc was connected by a short link of chain to a very strong spring inside the lock, and was wound up." On release by use of the trigger, the pistol was fired. The wheel-lock remained the accepted type of pistol until the Civil War, towards the end of which it was gradually succeeded by the flint-lock.

In action the wheel-lock was not over-satisfactory, if contemporary evidence is to be accepted. If the wheel were wound, or "spanned," as it was then termed, up too long before the time of use, the spring often refused to work in the moment of need. In Ludlow's Memoirs (Vol. I, p. 72) he says that in hand-to-hand conflict during the siege of Wardour he had to rely entirely upon his sword as his ". . . pistols, being wheel-locks and wound up all night, I could not get to fire." And Vernon, in the "Young Horseman," 1644, p. 11, advises his cavalrymen thus: "Never prime before you have spanned, and never span before you have need, because many times the firelock pistols will not go off if they have stood long spanned." Captain Pollock will find other information of value for his next edition in Vernon's book if he so cares.

It is of topical interest to remember that the Reiters, early exponents of German "frightfulness," were the first to make consistent use of the pistol. In de la Noue's "Politicke and Military Discourses," 1587, which I also commend to Captain Pollock, it is stated on page 199 that we must grant the Reiters "the honour of being the first that brought the pistol into use, which when a man can well handle I take to be very dangerous. The Germans among all sorts of horsemen that use this weapon do carry away the prize." Preparedness for war is not only a modern virtue with our friends the enemy.

During the reign of Elizabeth a long-barrelled pistol called the "petronel" was much in use. Captain Pollard suggests the following derivation for the name, "either from *poitrine-al*, the French word *poitrine*, meaning 'chest,' and indicating the mode of firing, the weapon being butted up against the breast, or from the Spanish word *pedragal*, 'stone,' in reference to the stone or flint held in the lock." May I suggest to the author that the word is really derived from the Spanish *petrina*, a belt, in which a pistol could be carried?

The flintlock which succeeded the wheel-lock in the middle of the seventeenth century remained in favour until the percussion system, invented in 1807, came into general use during the great peace which succeeded the troubles of the Napoleonic wars. From the percussion system to that prevailing to-day was a simple course of evolution.

In the eighteenth century inventive capacity in the matter of firearms being practically at a standstill, all effort tended towards the improvement of the existing arm, both mechanically and artistically. As the author points out, it is from this period that the most beautiful weapons come.

It was during this period that pistols entered largely into the science and art of duelling. Difficult though markmanship with a pistol may be, it is yet simpler than the use of the sword. By mistake the worst shot may hit a vital point of his target, but there is no room for error in fencing. Hard study and constant practice make the swordsman, in addition to inborn aptitude. The use of the pistol also permitted the infirm to defend their honour in the duel.

With the pistol, William, Lord Byron, great-uncle of the poet, killed William Chaworth in 1765, within the private room of an inn, for which offence he was tried by his peers. The pistol was the weapon chosen by the Duke of Wellington when he fought Lord Winchelsea at Battersea in 1829. The latter fired his pistol in the air and apologised, that he might avoid the risk of terminating an heroic life.

Pistols gave to highwaymen a chance of distinction in their chosen career, and helped thereby to enrich the pages of childhood's literature. Claude Duval, aided no less by a pistol than by charm of manner, was enabled to rob his fairest victims and then to dance the saraband with them under an approving moon. Dick Turpin would have had little need to ride to York had not his pair of pistols suggested the simple outlines of a profitable profession to him.

The book from page 74 onwards deals with ammunition (one chapter), with modern pistols and revolvers, and the manner of their use. The gradual development of ammunition is shown, with illustrations of various

types of bullets and cartridges. As a minor criticism, one is inclined to be disappointed by the lack of detailed drawings of sections of different cartridges. Such photographs as are given would appear to have been taken from makers' catalogues.

The descriptions of both automatic pistols and revolvers are very thorough, and demonstrate the author's exhaustive knowledge of this branch of the subject. This part of the book is clearly illustrated. The photographs in the historical section are spoilt in some cases by overcrowding, with the result that the detail is lost in reproduction.

In a chapter on the pocket automatic and revolver he speaks of the law in regard to the shooting of burglars, and advises his readers to avoid shooting burglars in the back if they desire to remain within the law. His veiled advice to those who dwell in Latin American Republics couched in the phrase, " . . . a wounded man means more legal trouble than a dead one," is commended to those whose interest in murder has so far been purely theoretic.

In a chapter headed "Miscellaneous Weapons" he has a little to say about the air-gun, which is still one of the persistent dangers of youth and a ready cause of inter-neighbourly war. Many domestic cats have been spoilt in their prime by the misplaced enthusiasm of a childish air-gunner. An interesting pistol described in this chapter is that known as the "Dedless," which is used "to render an assailant unconscious by means of a discharge of asphyxiating gases," and fires a cartridge composed of "pepper, lycopodium powder, and other ingredients."

The author shines most in his instructions to those who desire to learn the entire art of shooting with pistols and revolvers and in the care of these weapons. It would appear from internal evidence that he has considerable experience in the use of small firearms, both at the range and under other conditions where rapid action is the surest guarantee of continued existence. All these portions of the book are of high practical value to officers in the Flying Services. The necessity for speed in training during the present war makes it impossible for the official schemes of education on such matters to be very thorough or exhaustive, and it is therefore necessary for keen officers to gain additional and necessary knowledge by their own efforts.

Much information is given as to shooting at Bisley and on various home ranges. This, in so far as Bisley is concerned, has but little interest during the war, when personally conducted tours to any of the many fronts enable officers to gain that experience which outvies all others—firing at human targets animated with similar bellicose feelings and actions towards the firer. The stern reality of war is superior to all the practice of peace-time. A cynic once said that one ball cartridge in every thousand blank cartridges fired on manœuvres would give a valuable element of reality to an otherwise dreary drama in which the actors are the sole spectators.

The author attempts to disarm criticism in his introductory chapter by stating that all he desires to achieve is a "brief summary of pistols in their wide variation," and then invites it at the end by referring to this book as one that he hopes "may some day be the standard authority on pistols and revolvers." If he is to achieve his desire, he must be prepared to make many alterations and additions. His illustrations must be less crowded in order that detail may be shown more clearly. Six and seven pistols shown in one octavo page cannot be given clarity. The book badly needs an index. He should also show more readiness to quote authorities, and, if the book is to be the standard work on the subject, he should include a bibliography. His history is a little inchoate, though not inaccurate. The book, viewed as a preliminary monograph, is of great interest. As an exclusive authority it requires reconstruction. But I for one would wish nothing better than to see an enlarged and modified edition, when peace comes again, take its place among those fundamental works on which scientific history is based.

THE PARLIAMENTARY AIR COMMITTEE.

Viscount Cowdray had a long interview with a great many Members of Parliament on June 26th. Most of them belong to the Parliamentary Air Committee, which is now a strong non-party body, including Peers and Commoners, and Mr. Joynson-Hicks, the chairman o fthe Committee, presided. Lord Cowdray was accompanied by all his colleagues on the Board—General Sir D. Henderson, Commodore Godfrey Paine, R.N., Sir William Weir, and Major Baird. They went with detail into the work and policy of the Board, and as many of the statements made were of a confidential character it would be improper to publish particulars of this private meeting.

It is rumoured that Members generally were very well pleased with the information, and some who have been keen critics of the Board in the House were most emphatic in their expressions of satisfaction. There can be no doubt that the effect of the meeting has been good. It is permissible to add that not the least gratifying of the particulars furnished had reference to the great advances that have been made in the rapid turning out of the various types of machine now in use.

THE UNITED STATES NAVY.

ALL ABOUT THE UNITED STATES NAVY. Compiled by E. Tyrrell from "Fighting Ships." Sampson Low, Marston and Co., Ltd. pp. viii and 56. 1s. net.

Since the days when Oscar Wilde included American mothers and American battleships among the ruins and curiosities of the New World, the Navy of the United States has progressed from a condition that was of interest to one of use. No longer can the antiquary find in the United States Navy ready material for an archaeological monograph on the ships of the ancients. The antique, save, perhaps, in the case of the President's yacht, has gone, and its place is taken by modern transatlantic efficiency typified in ships graced with the exotic beauty of the Statue of Liberty and possessed of all the inherent engineering virtues of a land of which the Ford automobile is typical.

The United States of America, having in accordance with the general practice of the day declared war on the Central Powers, their Navy, assisted by that of Great Britain, will be actively engaged in the suppression of German naval activity in European waters. It is, therefore, opportune that Messrs. Sampson Low, Marston and Co. should publish a book of silhouettes of the fighting ships belonging to the new Ally.

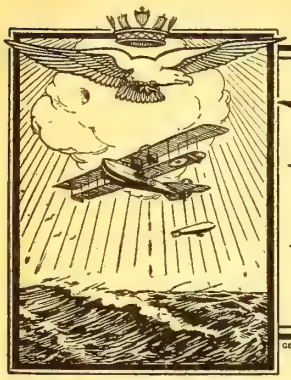
In it are illustrated all classes of ships in the U.S. Navy, from the latest Dreadnoughts, such as the "California" and the "Tennessee," to a survey ship euphoniously known as the "Paducah." The principal dimensions and armament are given in almost every case, and so long as an American man-of-war can be persuaded to present a broadside view there is little reason why the weary Londoner seeking relaxation at Margate, or the R.N.A.S. officer on the coast, should not gladden his heart by recognising, with no less accuracy than that of a sea-going naval officer, the ships of our transatlantic cousins. Furthermore, there are illustrations of the naval flags and of the rank distinctions on the uniforms of American naval officers—information which is of high value in these days of blue-garbed hotel porters and cinema guardians.

Two maps are given, one showing the naval stations of the United States and the other the complicated Atlantic entrance to the Panama Canal.

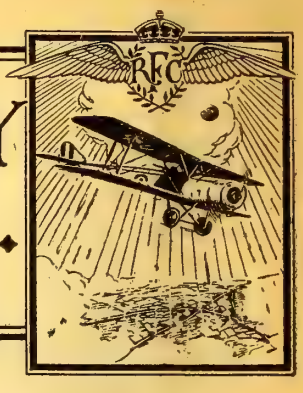
The booklet may be obtained for 1s. 3d., post free, from The Wm. Dawson Publishing Co., Ltd., 2, Breams Buildings, E.C.

VON RICHTHOFEN'S CIRCUS.

There has been so great a demand from officers of the Royal Flying Corps for copies of the original photograph of Captain Baron von Richthofen's "Travelling Circus," that arrangements have been made to supply enlargements to any who require them. These enlargements, which are bromide prints of excellent quality, may be had in the following sizes:—8 in. by 6 in. 1s. 6d., post free; 12 in. by 9 in., 5s., post free; 24 in. by 18 in., 10s. 6d., post free. The last size makes a handsome picture for framing. These may be had from Messrs. Ashworth and Meredith, Photo Engravers, 190, Strand, W.C.2.



NAVAL and MILITARY AERONAUTICS



FROM THE "LONDON GAZETTE."

Admiralty, June 18th, 1917.

R.N.A.S.—To be temp. Obsr. Lts.—R. G. St. John, Feb. 7th, 1916. H. A. Furniss, R. W. Gow, D.S.C., June 30th, 1916. E. F. Turner, Aug. 2nd, 1916. F. J. Dean, J. A. Macnab, Oct. 5th, 1916. J. L. Kerry, D.S.C.; A. W. C. Halcombe, D. C. Evans, April 1st.

R.N.V.R.—Graded as Flt. Lt.—Asst. Payr. W. B. Callaway, R.N., May 23rd.

War Office, June 26th, 1917.

REGULAR FORCES.—Staff.—(Graded for purposes of pay as a Staff Capt. whilst comdg. a Sqdn., R.F.C., Cadet Wing.)—Capt. J. B. Batten, D.S.O., R. Fus., Spec. Res., and to be secd., May 28th.

Establishments.—R.F.C.—Mil. Wing.—Park Comdr.—Temp. Capt. A. K. Hall, Gen. List, from an Equipment Officer, 1st Cl., and to be temp. Maj. whilst so empld., June 1st.

War Office, June 27th, 1917.

REGULAR FORCES.—Staff.—The following temp. appt. is made at the War Office:—Staff Lt.—Capt. E. S. Skipper, R.F.C., Spec. Res., from an Equipment Officer, 3rd Cl., R.F.C., June 7th.

Establishments.—R.F.C.—Mil. Wing.—Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld.:—Temp. Sec. Lt. L. S. White, M.C., Gen. List, May 3rd. Temp. Lt. C. G. Rushton, Gen. List, May 30th. Temp. Lt. F. D. Stevens, Gen. List; Sec. Lt. W. C. Campbell, Spec. Res., June 9th. Temp. Lt. A. E. Illingworth, Gen. List, June 11th. Sec. Lt. (temp. Lt.) R. M. Findlay, Yeo., T.F., June 15th.

Balloon Comdrs.—(Graded as Balloon Officers).—From Balloon Officers:—Temp. Capt. H. V. Knox, Gen. List, May 25th.

Equipment Officers.—1st Cl.—From the Sec. Cl., and to be temp. Capts. whilst so empld. June 1st:—Sec. Lt. (temp. Lt.) R. K. C. Maguire, Spec. Res.; Sec. Lt. (temp. Lt.) C. N. Seemann, Spec. Res. 2nd Cl.—From 3rd Cl.—Maj. R. A. Constantine, York R., T.F., June 1st.

War Office, June 28th, 1917.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing.—Flt. Comdrs.—From Flying Officers.—Capt. A. Somervail, M.C., K.O.S.B., T.F., March 31st; Lt. R. H. Marshall, North'n R., Spec. Res., and to be temp. Capt. whilst so empld, April 20th. From Flying Officers, and to be temp. Capts. whilst so empld.:—Temp. Lt. F. Sharpe, Notts and Derby R., June 3rd. Lt. I. P. R. Napier, Arg. and Suth'd Highrs., T.F., June 5th. Temp. Lt. A. V. Burlton, Gen. List, June 6th. Temp. Lt. C. J. Dickinson, Gen. List; Sec. Lt. J. B. Home-Hay, Arg. and Suth'd Highrs., T.F.; temp. Sec. Lt. W. A. McClatchie, Gen. List, June 7th. Temp. Sec. Lt. C. C. Sharp, Gen. List, June 8th. Sec. Lt. (temp. Lt.) J. L. M. de C. Hughes-Chamberlain, Suff. R., and to be secd., June 12th.

Memoranda.—Flt. Lt. C. L. E. Geach, from R.N.A.S., to be temp. Capt., for duty with R.F.C., April 27th, 1917, with seniority from July 28th, 1915. (Substituted for the notification in the "Gazette" of May 17th, 1917.) Temp. Sec. Lt. (temp. Lt.) R. H. Sievwright, Gen. List, to be temp. Capt. whilst empld. under R.F.C., April 12th, 1917. Sec. Lt. F. L. Royle, Yorks L.I., T.F., to be temp. Capt. (without the pay or allowances of that rank), whilst specially empld. under R.F.C., May 9th, 1917.

Admiralty, June 29th, 1917.

ROYAL NAVY.

Comdrs. to be Capts.

Harold D. Briggs. Robert M. Groves, D.S.O.,

Lt.-Comdr. to be Comdr.

Frederick C. Halahan, M.V.O.

ROYAL NAVAL AIR SERVICE.

The following promotions have been made, to date June 30th:—

Wing Comdrs. to be Wing Capts.

Harold D. Briggs (Act. Wing Capt.).
Frederick C. Halahan, M.V.O.
Henry P. Smyth-Osbourne.

Sqdn. Comdrs. to be Wing Comdrs.

Douglas A. Oliver, D.S.O.
Alexander Ogilvie (Actg. Wing Comdr.).
Hon. Claud M. P. Brabazon.
Frederick W. Bowhill.
Edmund D. M. Robertson.
John T. Cull, D.S.O.
Hugh A. Williamson.
Henry M. Cave-Browne-Cave.
Joseph R. W. Smyth-Pigott, D.S.O.

Sqdn. Comdr. to be Actg. Wing Comdr.

Francis K. McClean.

Flt. Comdrs. to be Sqdn. Comdrs.

Francis G. Brodribb (Actg. Sq. Comdr.).
Tom D. Mackie.
Harold E. M. Watkins.
Richard C. M. Pink.
Thomas W. Elsdon.
Ernest V. S. Wilberforce.
John Dunville.
Charles F. Pollock.
Robert C. Hayes.
Richard S. Robinson.
Ralph J. J. Hope-Vere (Actg. Sqdn. Comdr.).
Ralph Whitehead.
Gordon L. Thomson, D.S.C.
Allan K. Robertson.
Bernard F. Fowler.
Douglas Harries.
George H. Scott.
Kenneth S. Savory, D.S.O.
Tom H. England, D.S.C.
Vincent Nicholl, D.S.C.
Bertram L. Huskisson, D.S.C.
Edwin H. Dunning, D.S.C.
The Hon. Roger Coke.
Henry N. M. Hardy, D.S.O.
James I. Harrison.
Frederick J. Rutland, D.S.C.
Roderic S. Dallas, D.S.C.

Flt. Lts. to be Flt. Comdrs.

Frederick M. L. Barr.
Walter H. S. Garnett.
Walter K. F. G. Warneford.
Gerald E. Livock.
Frank G. Andreae.
Charles B. Dalison (Actg. Flt. Comdr.).
Hugh C. Morris.
John D. Newberry (Actg. Flt. Comdr.).
Frank T. Digby, D.S.C.
Christopher E. Wood (Actg. Flt. Comdr.).
Dudley W. A. Barton.
James B. P. Ferrand, D.S.O.
John F. S. Morrison.
Frederick G. D. Hards, D.S.C.
Richard C. Hardstaff (Actg. Flt. Comdr.).
Theophilus C. Vernon (Actg. Flt. Comdr.).
Arthur F. F. Jacobs.
Frank Fowler, D.S.C. (Actg. Flt. Comdr.).
Alexander R. Cox (Actg. Flt. Comdr.).
Colin T. MacLaren (Actg. Flt. Comdr.).
Cecil D. Morrison (Actg. Flt. Comdr.).
John R. Davison.
Edward S. Cripps.
Bernard C. Windeler.
Arthur H. Chandler.
Ernest A. O. Auldjo-Jamieson.
Denzil R. Thurstan.
Wilfred H. Dunn.
Reginald M. Everett (Actg. Flt. Comdr.).
Henry K. Thorold, D.S.C. (Actg. Flt. Comdr.).
Ernest W. Norton, D.S.C. (Actg. Flt. Comdr.).
Egbert Cadbury, D.S.C.
Stanley Bell.
Brian C. Clayton (Actg. Flt. Comdr.).
Clarence MacLaurin.
Charles T. Freeman, D.S.C.
Guy V. Leather.
Cecil H. Hayward (Actg. Flt. Comdr.).
Charles C. R. Edwards, D.S.C. (Actg. Flt. Comdr.).
Horace E. Crawfurd.
Herbert G. Brackley, D.S.C. (Actg. Flt. Comdr.).
Sebastian O. Smith.
Stanley S. Goble, D.S.O., D.S.C. (Actg. Flt. Comdr.).
Frederick E. Sandford.
Gerald E. Hervey (Actg. Flt. Comdr.).
Maurice R. Buckland.
Herbert G. Travers (Actg. Flt. Comdr.).
William Tesh.
Henry G. R. Malet.
Alfred Gammon.
Kenneth C. Buss.
Thomas F. Le Mesurier, D.S.C. (Actg. Flt. Comdr.).
William G. McMinnies (Actg. Flt. Comdr.).
Irwin N. C. Clarke, D.S.C. (Actg. Flt. Comdr.).
Robert J. O. Compston, D.S.O. (Actg. Flt. Comdr.).

Richard B. Munday (Actg. Flt. Comdr.).
George H. Jackson (Actg. Flt. Comdr.).
Matthew A. Simpson.
John S. Wheelwright.
Bruno P. H. de Roeper (Actg. Flt. Comdr.).
Reginald F. S. Leslie.
Ralph S. Booth.
Godfrey M. Thomas.
Christopher J. Galpin.
James G. Struthers.
Ronald S. Smith.
Stafford St. G. C. Belfield.
Charles L. Scott.
John B. Cole-Hamilton.
Eric T. Bradley.
Forrester H. M. Maynard (Actg. Flt. Comdr.).
Francis J. Linnell.
William H. Watt.
Louis D. Morrison.
William F. Horner.
Athol W. Mylne.
Ralph A. Cochrane.
William E. Gardner, D.S.C. (Actg. Flt. Comdr.).
Charles D. Booker (Actg. Flt. Comdr.).
Alexander M. Shook (Actg. Flt. Comdr.).
Lloyd S. Breadner, D.S.C. (Actg. Flt. Comdr.).

FLT. SUB-LTS. TO FLT. LTS.

Charles H. M. Chapman.
Michael Birkbeck.
Leo. P. Paine.
Charles N. Geale.
Augustine F. Marlowe.
Samuel M. Kinkead.
Llewellyn Edwards (Actg. Flt. Lt.).
Rupert E. Darnton.
Howard J. T. Saint.
Arthur T. Sketchley.
George C. V. Hewson.
Walter E. Traynor.
Henry E. Weaver.
Charles H. B. Jenner-Parson.
Carl D. Newman.
George H. Bittles.
Angus J. H. MacCall.
Reginald F. Maitland.
Reginald E. V. Jelliffe.
Paul D. Robertson.
Harold Tether (Actg. Flt. Lt.).
Charles E. Rich.
Howard V. Terry.
Frederick A. Best.
James F. Hart.
Geoffrey K. Blandy.
Joseph W. Hobbs.
Herbert G. Leslie.
Arthur G. Woodward.
John F. Dixon.
John R. Crouch.
Eric C. H. Tebb.
Bernard W. Hemsley.
George W. Biles.
Charles E. Burden.
Ormrod M. Ayrton.
Edward B. Waller.
John E. Barrs.
Lloyd Whitworth.
John A. Fage.
Ernest J. Cuckney, D.S.C.
John S. N. Rockey.
Sidney J. Woolley.
George L. Hartgill.
Donald E. Harkness, D.S.C.
John H. Woolner.
Donald C. Waylen.
Frederick S. Cotton.
John O. Galpin.
Frank Towers.
Fred. C. Armstrong.
Ronald F. Redpath.
John H. Keens.
Melville C. Wood.
Melville G. Dover.
Victor H. Ramsden.
Robert Leckie, D.S.C.
Charles E. Roach-Smith.
Benjamin N. Harrop.
Jean de Francia.
Alfred H. H. Gilligan (Actg. Flt. Lt.).
Basil D. Hobbs, D.S.C.
William E. Robinson.
Edward S. Boynton.
Arnold J. Chadwick.
Percy G. McNeil.
Horace A. H. Leetham.
Arthur S. Elliott.
George L. Nichols.
Philip L. Bryant.
Frederick P. Collins.
Raymond Collishaw.
Charles B. de T. Drummond.
Walter J. Calderwood.
Gerald A. Magor.
George R. Hodgson.
James L. Gordon.
Everard J. B. How (Actg. Flt. Lt.).
Humphrey L. Everitt (Actg. Flt. Lt.).
Nigel H. Fletcher.
Joseph S. T. Fall, D.S.C.
David M. Ballantyne.
John E. Sharman, D.S.C.
Arthur H. Pearce.
David G. Donald (Actg. Flt. Lt.).
George D. Kirkpatrick.
Hilary G. Nares.
Robert E. Spear.
Rupert R. Winter.
Cecil G. Bronson.
Charles McNicholl, D.S.C.
Dudley B. M. Hume.
John E. A. Hoare.
Victor R. Scriven.
William M. Alexander.
Arthur F. Brandon.
Harold T. Mellings, D.S.C.
Hubert S. Broad.
Charles Gilmour.
Ronald R. Thorneley.
John E. Scott.
Leonard H. Rochford.
William H. Richardson.
John E. Brewin.

OBSERVER SUB-LTS. TO BE OBSERVER LTS.

Gerald H. Courtenay Luck.
Norman H. Starbuck.
Gurth A. Richardson.

WARRANT OFFICERS, 2ND GRADE, TO BE WARRANT OFFICERS, 1ST GRADE.

Henry C. Bobbett.
Frank Everett.
William F. Floyd.
Charles King.
Leonard R. Staddon.
James V. Collins.
Philip H. Hunter.
Norman Littlejohn.
Frank Susans.
Donald E. Shaw.
Thomas Marchant.
G. J. Squires.
Albert Deakin.
William G. Coleman.
Bertie S. Brice.
Joseph C. Andrews.
Frederick J. Hooper.
Frank Edwards.
Walter C. England.

WAR OFFICE, June 29th.

REGULAR FORCES.—ESTABLISHMENTS.—Equipment Officers, 1st Cl.—Sec. Lt. (temp. Lt.) N. C. F. Francis, Spec. Res., from 2nd Cl., and temp. Capt. whilst so empld., May 26th.

TERRITORIAL FORCE.—R.H. AND R.F. ARTILLERY.—Sec. Lt. (temp. Lt.) (temp. Capt., R.F.C.) R. S. McClintock to retain the temp. rank of Capt., R.F.C., and to remain secd.

WAR OFFICE, June 30th.

The King has been pleased to confer the Military Cross on the following officers in recognition of their conspicuous gallantry in attacking and destroying an enemy airship:—

Capt. R. H. M. S. Saundby, R. Warwick R. and R.F.C.
Sec. Lieut. L. P. Watkins, Canadian Inf. and R.F.C.

WAR OFFICE, July 3rd.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld.—Lt. A. E. McKay, Spec. Res., April 26th. Sec. Lt. (temp. Lt.) J. O. Leach, M.C., Midd'x R.; Sec. Lt. A. P. M. Sanders, North'd Fus., June 4th. Temp. Sec. Lt. I. V. Pyott, D.S.O., Gen. List, June 18th.

SPECIAL RESERVE OF OFFICERS.—SUPPLEMENTARY TO REGULAR CORPS.—R.F.C.— MIL. WING.—Sec. Lt. H. S Lees-Smith (Capt., S. Afr. Def. Force) to be Lt., June 1st, 1917. Lt. H. S. Lees-Smith to be Capt., June 6th, 1917.

FROM THE COURT CIRCULAR.

BUCKINGHAM PALACE, June 30th.

The following had the honour of being received by the King this morning, when His Majesty invested them with the Insignia of the Orders into which they have been admitted.

THE MOST DISTINGUISHED ORDER OF ST. MICHAEL AND ST. GEORGE

Brig.-Gen. L. Charlton.
Brig.-Gen. J. Salmond.
Lt.-Col. G. Livingston, London Regt. and R.F.C.

THE DISTINGUISHED SERVICE ORDER AND THE MILITARY CROSS.

Major Leonard Learmount, R.F.C.
Major Henry Petre, Australian F.C. and R.F.C.

THE DISTINGUISHED SERVICE ORDER.

Sqdn. Comdr. Edward Newton-Clare, R.N.A.S.
Lt.-Col. Frederick Cleaver, R.F.C.

The King then conferred decorations as follows:—

THE DISTINGUISHED SERVICE CROSS.

Flt. Lt. William Gardner, R.N.A.S.

THE MILITARY CROSS.

Capt. Harold Jensen, General List and R.F.C.
Capt. Geoffrey Knight, R.F.C.
Lt. William Harper, Durham L.I. and R.F.C.
Lt. Hugh Robb, R.F.C.
Sec. Lt. Arthur Turner, R. War. R., attd. R.F.C.

* * *

Capt. A. J. Evans (R.F.C.), and Lt. S. E. Buckley (Northamptonshire Regt. and R.F.C.) had the honour of being received by the King yesterday.

NAVAL.

The following appointments have been made in the Royal Naval Air Service:—

JUNE 27th.—Messrs. W. A. Johnson and S. E. Ould granted temp. coms. as Lts. (R.N.V.R.), both with seniority June 23rd.

JULY 3rd.—Lt. R. B. Maycock graded as a prob. Flight Comdr., to date June 30th. [What is a prob. Flt. Comdr.?—Ed.]

Mr. G. L. Tyser granted a temp. commn. as Lt., R.N.V.R., with seniority June 28th.

Temp. Lt. (R.N.V.R.) G. H. Millar entered as prob. Observer Officer, to date June 17th.

ADMIRALTY COMMUNIQUÉS.

JUNE 26th.—In the course of a patrol on the 25th inst. three machines of the Royal Naval Air Service encountered and engaged 10 enemy machines in the vicinity of Roulers.

After 16 minutes' fight one enemy machine was seen to go down in flames. It is thought that two more were driven down out of control, but owing to clouds this could not be verified.

Our three machines finished their patrol and returned safely.

THE CASUALTY LIST.

Reported June 27th.

ACCIDENTALLY KILLED.—Flt. Sub-Lt. John N. McAllister, R.N.
MISSING.—Flt. Sub-Lt. Robert G. Saunders, R.N.
Flt. Sub-Lt. Alan B. Holcroft, R.N.
PREVIOUSLY REPORTED MISSING, NOW OFFICIALLY REPORTED PRISONER OF WAR.—Flt. Sub-Lt. Arthur S. Mather, R.N.

Reported June 30th.

ACCIDENTALLY KILLED.—Jones, Flt. Sub-Lt. A. C., R.N.
MISSING, BELIEVED PRISONER.—Nash, Flt. Sub-Lt. G. E., R.N.
ACCIDENTALLY INJURED.—Clark, Flt. Sub-Lt. W. E. N., R.N.
Orfeur, Observer Sub-Lt. C. B., R.N.

Reported July 2nd.

ACCIDENTALLY KILLED.—Tulley, Flt. Sub-Lt. J. R., R. N.

Missing.—Brady, Flt. Sub-Lt. B. J W., R.N.
Marsh, Obr. Sub-Lt. L., R.N.
Correction.—Accidentally Injured.—Flt. Sub-Lt. Warwick B. W. Clarke, R.N., and not as previously announced—Flt. Sub-Lt. William E. N. Clark, R.N.
Previously presumed Killed, now officially reported Killed.—Heald, Lt. Ivan, R.N.V.R., attd. R.F.C.

PERSONAL NOTICE.

Marriage.

CROSS—BARKER.—On June 22nd, at U.F. Church, Burnt Island, Fifeshire, Flt. Lt. Bernard C. H. Cross, R.N., son of Mr. and Mrs. H. E. Cross, of Elborough Street, Southfields, London, was married to Jessie L. Barker, of Southfields, by the Rev. A. Scott Murray, B.D.

It is officially notified that letters and parcels for officers and men of the Royal Naval Air Service who are serving abroad should be addressed as follows: Name of addressee (stating rank or rating), unit in which serving (e.g., No. 4 Wing or No. 11 Kite Balloon Section), care of G.P.O. The words "B.E.F." should not be used.

* * *

Flt. Sub-Lt. L. P. Paine, D.S.C., R.N., who was reported missing is now reported to be a prisoner of war. Sub-Lt. Faine, who is a brother of Mr. Hubert Scott Paine, director of the Supermarine Aviation Works, Ltd., at Southampton, has long been concerned with aeronautics. He was engaged with his brother Hubert in experimental work as far back as 1910, and has been closely connected with developments ever since. Before being taken prisoner he had seen a considerable amount of service in Egypt.

MILITARY.

G.H.Q. Communiqués.

June 26th, 9.12 p.m.—In air fighting yesterday two German aeroplanes were brought down, and three other hostile machines were driven down out of control.

One of our aeroplanes is missing.

June 27th, 9.4 p.m.—Much successful work was accomplished by our aeroplanes again yesterday.

In air fighting, five German machines were brought down and two others were driven down out of control. In addition, one hostile machine was shot down by fire from the ground.

None of our aeroplanes are missing.

June 28th, 9.10 p.m.—Activity in the air continued yesterday One enemy aeroplane was brought down in air fighting, and two others were driven down out of control. In addition, two hostile machines were shot down, and two others driven down by fire from the ground.

Four of our aeroplanes are missing.

June 29th, 8.55 p.m.—One German aeroplane was brought down yesterday in air fighting.

None of our machines are missing.

June 30th, 9.5 p.m.—Several encounters took place in the air yesterday between our aeroplanes and large formations of hostile machines.

As a result of the fighting, five German aeroplanes were brought down and four others were driven down out of control. One other enemy machine was shot down by fire from the ground.

One of our aeroplanes is missing

War Office Communiqués.

June 27th.—The General Officer Commanding British Forces in Macedonia reports:—The R.F.C. and R.N.A.S. have bombed Provista and Razolivos (east of the southern end of Lake Tahinos), Demir-Hissar, and other places south of the Rupel Pass, and Furka (west of Lake Doiran), causing damage to the enemy's camps and dumps.

June 28th.—The General Officer Commanding Mesopotamia Expeditionary Force reports:—On the 22nd inst. our aeroplanes bombed one of the few remaining Turkish river steamers, obtaining at least one direct hit with a 65-lb. bomb.

On June 25th hostile aeroplanes bombarded our camps without doing any damage. On the following day we retaliated by dropping 24 bombs on the enemy's camps at Tekrit (on the Tigris, about 30 miles above Samarra). Seven direct hits were observed on tents, which were destroyed, and other bombs exploded close amongst the enemy's tents, inflicting damage. All our machines returned safely.

June 29th.—The Secretary of the War Office makes the following announcement respecting the campaign in Palestine:—

The general situation remains unchanged.

There has been considerable patrol activity in which we have secured prisoners.

Successful air raids have recently been carried out. Six hundred and fifty pounds of bombs were dropped on the supply depot at Tul Keram on June 23rd, severely damaging rolling stock and the station buildings. On the same date 1,180 lb. of bombs were dropped on the aerodrome at Ramleh.

On June 26th some 50 bombs were dropped on the military establishments near Jerusalem.

The Casualty List.

Reported June 27th.

Killed.—Armitage, Sec. Lt. G. J., R.F.A., attd. R.F.C.
Bailey, Sec. Lt. L. J., R.F.C.
Sayer, Sec. Lt. C. M., R.F.C.
Wounded.—Stroud, Sec. Lt. H., R.F.C.
Missing.—Coles, Lt. W. T., Oxon. and Bucks L.I., attd. R.F.C.
Spearpoint, Sec. Lt. H. G., R.F.C.
Canadian Contingent.—Killed.—Wickson, Capt. E. A., Inf., attd. R.F.C.
Died.—Macaskill, Lt. W. R., Nova Scotia, attd. R.F.C.
Previously reported Missing, now reported Died.—Stuart, Capt. J. D., Pioneers, attd. R.F.C.
Wounded.—Birkett, Lt. W., Central Ontario, attd. R.F.C.

Reported June 28th.

Killed.—Jackson, Lt. H. M., R.F.C.
Accidentally Killed.—Clarke, Sec. Lt. N. V., R.F.C.
Previously reported Missing, now reported Killed.—Richardson, Capt. L. L., R.F.C
Wollen, Sec. Lt. D. C., R.F.C.
Wounded.—Ansell, Sec. Lt. L., Lond. R. and R.F.C.
Body, Lt. G. C., R.F.C.
Boucher, Lt. N., R.W. Kent R. and R.F.C.
Craig, Sec. Lt. J. A., R.F.C.
Dawson, Sec. Lt. W. E., R.F.A. and R.F.C.
Missing.—Barlow, Lt. H. C., Lanc. Fus., attd. R.F C.
Bennie, Sec. Lt. R. S., R.F.C.
Ellis, Lt. R. W., R.F.C.
Lloyd, Sec. Lt. R. S., R.F.C.
Philip, Sec. Lt. E. T., R.F.A., attd. R.F.C.
Previously reported Missing, now reported Prisoners in German Hands.—Heyworth, Lt. E. L., R.F.C.
McKissock, Sec. Lt. C. W., R.F.C.

Reported June 29th.

Killed.—Lucas, Lt. T. F., R. War. R. attd. R.F.C.
Newton, Lt. M. E., Lond. R. and R.F.C.
Wounded.—Currington, Sec. Lt. J. R., Linc. R., attd. R.F.C.
Gardiner, Sec. Lt. P. J., R.F.C.
Webb, Sec. Lt. G. F., R.F.C.
Missing.—Atkins, Sec. Lt. G. C., R.F.C.
Bean, Sec. Lt. B. H., R. Welsh Fus. and R.F.C.
Caulfield, Sec. Lt. T. St. G., R. Innis. Fus., attd. R.F.C.
Lloyd, Lt. D. R. C., R.F.C.

Reported June 30th.

Killed.—Cameron, Sec. Lt. R., Sco. Rif., attd. R.F.C.
Previously reported Missing, believed Killed, now reported Killed.—Pinson, Sec. Lt. I. L., S. Staffs. R., attd. R.F.C.
Previously reported Missing, now reported Killed.—Croft, Sec. Lt. H. A., R.F.C.
Green, Sec. Lt. H. J., R.F.C.
Hodgson, Capt. G. B., R.F.C.
O'Beirne, Sec. Lt. J. I. M., R. War. R., attd. R.F.C.
Underwood, Sec. Lt. G. M., R.F.C.
Wounded.—Hammond, Lt. H. B., M.C., R.F.A., attd. R.F.C.
MacLaren, Sec. Lt. W. F. E. De B., L'pool R., attd. R.F.C.
Missing.—Davidson, Capt. T., Cameron Highrs., attd. R.F.C.
Previously reported Wounded and Prisoner, now reported Died of Wounds as Prisoner in German Hands.—George, Lt. H. D. K., R. Dublin Fusiliers, attd. R.F.C.
Previously reported Wounded and Missing, now reported Prisoners in German Hands.—Edwards, Sec. Lt. E. L., Welsh R., attd. R.F.C.
Kirby, Sec. Lt. H., R.F.C.
Moore, Sec. Lt. E. S., R.F.C.
Woolliams, Sec. Lt. F. H., R.F.C.
Australian Force.—Accidentally Killed.—Bartle, Sec. Lt. T. W., F.C.
Herd, Lt. R. H., F.C
Kitson, Sec. Lt. H. S., F. C.
Canadian Contingent.—Killed.—Bigwood, Lt. P. H., Infantry, attd. R.F.C.

Reported July 2nd.

Missing.—MacBrayne, Sec. Lt. D. C. H., R.F.C.
McFerran, Sec. Lt. T. M., R.F.C.
Previously reported Missing, now reported Prisoners in German Hands.—Grierson, Sec. Lt. C. D., Yeo. and R.F.C.
Smith, Lt. B., Essex R. and R.F.C.
Sutherland, Sec. Lt. A. M., North'd Fus. and R.F.C.
Died.—R.F.C.—Howell, 42590 1st Cl Air Mech. C. T. (Liverpool).
Previously Missing, now reported by German Government Killed or Died of Wounds.—R.F.C.—Fleming, 14454 Cpl. R. D. (Carmunnock).

Reported July 3rd.

Killed.—Davis, Sec. Lt. L. A., R.F.C.
Previously reported Wounded, now reported Died of Wounds.—Stacey, Sec. Lt. D. W., R.F.C.
Wounded.—Bolton, Capt. N. A., R.F.C.
Gill, Sec. Lt. A. E., R.F.C.
Sykes, Lt. H. K., R.F.C.

Missing.—Harker, Sec. Lt. G. T., R.F.C.
Previously reported Missing, now reported Killed.—Hamer, Lt. H., R.F.C.
Harvey-Kelly, Major H. D., D.S.O., R. Irish R., attd. R.F.C.
Grevelink, Lt. E. J. Y., D. of Well. R., attd. R.F.C.
Neill, Sec. Lt. R. M., R.F.C.
O'Longan, Sec. Lt. P. C. S., R. Irish R., attd. R.F.C.
Sheehan, Sec. Lt. D. J., R.F.C.
Accidentally Killed.—Franklin, Sec. Lt. R. V., R.F.C.
Previously reported Missing, now reported Prisoner of War in German Hands.—Kaiser, Sec. Lt. M. M., R.F.C.
Previously reported Prisoners of War, now reported Wounded and Prisoners of War in German Hands.—Binnie, Lt. A., R. Scots Fus., attd. R.F.C.
Birks, Lt. N. A., R.F.C.
Brockhurst, Sec. Lt. G. N., R.F.C.
Heagerty, Sec. Lt. J. F., the Buffs (E. Kent. R.), attd. R.F.C.
Heyworth, Lt. E. L., R.F.C.
Rickards, Sec. Lt. A. R. M., R.F.C.
Died.—R.F.C.—Hill, 11024 2nd Cl. Air Mech. G. N. (Blackwater, Hants).
Accidentally Killed.—R.F.C.—Taylor, 49566 2nd Cl. Air Mech. A. E. (Northwich).

PERSONAL NOTICES.

Deaths.

ADENEY.—Sec. Lt. Robert Edward Adeney, the Queen's (Royal West Surrey Regt.), attached R.F.C., reported "missing" on April 11th, and now reported by the Comité International de la Croix-Rouge, Geneva, to have died at Douai from wounds received in an aerial action on that date, was the only son of Mr. and Mrs. W. H. Adeney, of Dulwich, and was aged 19. He was educated at the City of London School and Hurstpierpoint College.

In March, 1915, at the age of 17, he joined the Inns of Court O.T.C., and received his commission the following June. Last August he was attached to the R.F.C., and got his "wings" in December.

His squadron commander writes:—"Lt. Adeney's patrol was seen to successfully engage a hostile patrol, two of which they destroyed, and about an hour later they were heavily engaged with a far superior number of hostile machines (ten to three) . . . He was one of the most universally liked officers in the squadron, he did not know what fear was, and had all the requisite qualities for a R.F.C. pilot. The whole squadron deplores his loss."

ASHLEY COOPER.—Lt. Cyril Ashley Cooper, E. York Regt., attached R.F.C., was killed on the 29th ult., together with a mechanic, while flying from a Scottish aerodrome. Mr. Cooper was the son of Mr. and Mrs. Ashley Cooper, of Lyndhurst, Elm Park Road, Winchmore Hill, N., and was commissioned to the East Yorks Regt. in May, 1915, whilst in France. He returned to this country, and later, in 1916, transferred to the R.F.C., obtaining his wings in Feb. last. At the time of the accident he was acting as instructor in gunnery.

BARRON.—Sec. Lt. H. E. Barron, R.F.C., was killed at Hendon on the night of June 25th through his machine falling to the ground. He was 42 years of age.

DARRON.—A verdict of death by misadventure was returned on June 28th at an inquest on Sec. Lt. John George Darron, 33, R.F.C., who was killed while flying. His machine fell about 150 ft.

FOLLIT.—Lt. Reginald William Follit, R.F.C., reported missing on April 28th, is now stated by his observer (a prisoner) to have died after an aerial engagement in France. He was the younger son of Mr. William Follit, of Avenue House, Clapham Park, S.W., was educated at St. Lawrence College, Ramsgate, and early joined the H.A.C. After the outbreak of war he was granted a commission in the R.F.A., and when in France was transferred to the R.F.C., acting as an observer. He obtained his pilot's certificate in England, and returned to the front on April 18th.

GEORGE.—Lieut. H. D. K. George, Royal Dublin Fusiliers and R.F.C., who died of wounds as a prisoner, was the only son of Mr. and Mrs. Duncan George, of Stanhope Terrace, Hyde Park, and was born at Satara on July 23rd, 1897. He was educated at Clifton (Barff's House), and passed direct into Sandhurst in September, 1914. After completing the Sandhurst course, he received a commission in the Royal Dublin Fusiliers, and, following a period of service with a battalion in Cork, he joined his regiment in France.

In July, 1916, he returned to England for a course of training for the R.F.C. In March, 1917, he went to the front, and during a reconnaissance far behind the German lines his patrol, under the command of Capt. Leefe Robinson, V.C., attacked and was heavily engaged with a large number of hostile aircraft. Mr. George's machine, piloted by Lieut. Leckler, was forced to land at Lewardi, south-east of Douai, where he was made a prisoner and removed to St. Clothilde's Hospital at Douai, wounded in the leg and back. In the German list, dated May 23rd, Mr. George is reported to have died on April 6th.

HAMBER.—Capt. Harold B. Hamber, R.F.C., son of the late Eric Hamber, of Winnipeg, Manitoba, and brother of E. W. Hamber, of Vancouver, British Columbia, aged 32, was accidentally killed on June 22nd while flying.

HARVEY-KELLY.—Major Hubert Dunsterville Harvey-Kelly, D.S.O., Royal Irish Regt., attached R.F.C., killed in action, was the son of the late Colonel H. H. Harvey-Kelly, of the Indian Army, and was born in 1891. He joined the Irish Regt. in 1910, got his captaincy five years later, and the rank of major very shortly afterwards. Major Harvey-Kelly has been a squadron commander in the Royal Flying Corps since the beginning of last year. For his services during the present war he has been mentioned in dispatches, and in 1915 was awarded the D.S.O.

Major Harvey-Kelly was among the most universally beloved officers of the R.F.C. Though very young for his rank, he won the confidence as well as the personal regard of all who served with him. A fine pilot, brave to recklessness, a humorist of the first class, and withal a good soldier, his loss will be deeply felt by all who knew him.

He learned to fly on Laffan's Plain in 1911 or so on a Cody machine, and in him has died the last of the pilots who flew the Cody biplanes Lieut. Wilfred Parke, R.N., Mr. Rogers-Harrison, Major Raleigh, and Mr. Cody himself have all gone before him. His early days in the R.F.C. were spent in the famous No. 2 Squadron, R.F.C. at Montrose, where, as everywhere, he made hosts of friends. From the beginning of the war he did splendid work, and, like so many gallant Irishmen, he gave his life in the service of the King of England.

LEE.—Capt. Richard Henry Driffield Lee, Norfolk Regt. and R.F.C., who was killed on June 23rd, while flying, was the only surviving son of the Rev. Frederick and Mrs. Lee, of Woodton Rectory, Bungay. He was 29 years old.

LINDSAY and SHARMAN.—Capt. George Walter Thomas Lindsay, R.F.A. and R.F.C., and 1st Class Air Mechanic C. E. Sharman, of Sheffield, were killed in an accident near Bristol on June 25th, their machine falling from a considerable altitude.

Capt. Lindsay was the eldest son of Col. H. E. Morgan Lindsay, C.B., R.E., of Ystrad, Mynach, near Cardiff, and a grandson of the first Baron Tredegar.

MORRIS.—Sec. Lieut. Francis St. Vincent Morris, Sherwood Foresters and R.F.C., who, at the age of 21, died of wounds received in action on April 10th, was the youngest of the four sons of Canon and Mrs. Morris, of Ashbourne, Derbyshire. Educated at Bowden House, Harrow, Seaford, and Brighton College, on leaving school he entered Wadham College, Oxford, but at once applied for and obtained a commission. Subsequently he was attached to the R.F.C., of which he became a most capable officer. In the execution of a daring flight his machine was brought down in a snowstorm, and from the serious injuries he received he died on April 29th. His three brothers are serving with their regiments in France.

NASON.—Capt. and Flight Comdr. John William Washington Nason, Royal Sussex Regt. and R.F.C., of Grosvenor Crescent, St. Leonards-on-Sea, who played cricket for Cambridge University in 1909 and 1910, and for Sussex and Gloucester Counties, and Association football for the University, and was killed on June 9th, aged 27, son of the late Dr. Nason, of Corse Grange, Gloucester, has left property of the value of £8,894. The will, made on active service, reads:—"Anything or any money I have is to be divided between you, Baby, and Charlie." Probate is granted to Lieut. William Frederick Charles Nason, R.F.C., his brother

NEILL.—Sec. Lt. Rolf Mayne Neill, R.F.C., whose death is officially announced, was killed in an air action in June 3rd, aged 19. He was the only son of Mr. Harold Neill, London correspondent of "La Prensa," Buenos Aires, and Mrs. Neill, of 22, Eldon Road, Kensington, W.8. He was educated at the Priory, Malvern, and Westminster School, where he was in the O.T.C., from which he went straight into the Royal Flying Corps. He was a keen footballer, and obtained his pinks. In three months he gained his "wings," and joined a squadron at the front. He was killed on the anniversary of the day on which he was commissioned. When he was missing his major wrote:—"Your son had done splendid work with us since he rejoined, and I cannot say how much we all miss him." A brother officer wrote:—"I have only known your son since he came back from hospital. In that short time I have learned to regard him as one of the very best fellows I have met out here, not so much because he knew no danger, but rather because, realising it, he never let it interfere with his duty."

REYNOLDS.—Lieut. Edgar Kinsey Reynolds, Canadian Infantry and R.F.C., was killed while flying on June 27th. He was the son of the late Mr. E. K. Reynolds, of the Ottoman Bank, Alexandria, and Mrs. Reynolds, of Calgary, and was 26 years old.

(*Continued on page 46.*)

AERONAUTICAL ENGINEERING

SUPPLEMENT TO "THE AEROPLANE"

INCORPORATING AIRCRAFT ENGINEERING, AERODYNAMICS, AND MATTERS PERTAINING TO THE AERONAUTICAL ENGINEER AND THE AIRCRAFT TRADER

The British Aircraft Industry.

BY CHARLES L. FREESTON.

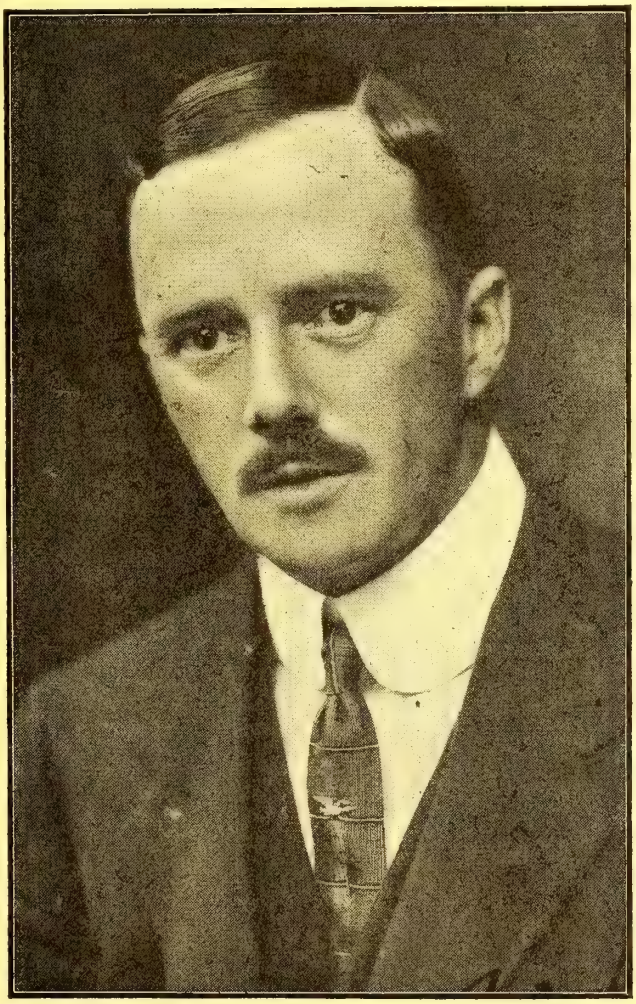
XXII.—GORDON WATNEY AND CO., LTD.

There was a certain period in motoring history when Mr. Gordon Watney proved himself to be something of a wonder-worker. Up and down the country there were numerous Mercédès cars which had become out of date, so far as catalogue models were concerned, but were otherwise efficient and sound as a bell. They were highly expensive cars, too, and their owners had to face the alternative of cutting a loss and conforming to current fashion by buying the latest Cannstatt model, or else rest content to jog along on something that was obsolete though serviceable.

Car Conversion.

To them in their perplexity appeared Mr. Gordon Watney as the welcome *deus ex machina*. Recognising the fact that the cars were of super-excellent material and workmanship, and mostly only needed bringing up to date in ways that were immediately visible, he conceived the idea of converting them accordingly. He established a workshop at Weybridge, and began to collect Mercédès cars, and by one means or another effect transformations in their appearance and design. With a lengthened wheel-base, a new bonnet, and something better than the old scroll clutch, to say nothing of other details, an old Mercédès could be made into a vehicle that was both smart and serviceable.

And Mercédès cars were so numerous in this country that Mr. Watney's workshop was kept busy for years with the process of conversion. In course of time the place became the recognised home for the products of Cannstatt and Stuttgart which needed repairs or any kind, and as "Mercédès specialists" the firm of Gordon Watney and Co., Ltd., were famous throughout the land.



Major Gordon Watney.

A Racing Reminiscence.

For Mr. Watney did his work well and had good stuff to handle. It may be doubted whether a better car of its type was ever built than the famous "sixty Merc." Even when it had been supplanted by the 90-h.p. models, it was good enough to win the Gordon Bennett Cup Race in Ireland in 1903, although much bigger cars had come along in the interim and were pitted against it.

Three "nineties" had, in point of fact, been entered for the great race, and were regarded as very likely winners, at all events the Mercédès crowd, with whom I happened to travel to Madrid after the first stage, which also proved to be the final, of the Paris-Madrid race, were in high feather as to their prospects for the coming event.

The Cannstatt Fire.

Then came the holocaust at Cannstatt, which reduced all the "nineties" to scrap-iron, and on the morning of the Gordon Bennett race in Ireland, when I ran against one of my former Sud-Express companions at Ballyshannon, nothing could have been more doleful than his expression or his predictions. The amateur-owned "sixties," which had been pressed into service, he did not regard as having a dog's chance, and, as a matter of fact, they did have one weak point—the back axle, which was not expected to stand the racket of the course.

However, as everyone familiar with motor-racing history will remember, though Baron de Caters and Foxhall Keene did come to grief with broken axles, Jenatzy sailed home the winner. The burly Chevalier de Knyff ever afterwards regretted that he paid too much respect to the course and took his first two laps too slowly on his Panhard.

A Keen Sportsman.

With a factory so near to Brooklands it was only natural that Mr. Gordon Watney should take an active interest in automobile racing, and right up to the close of the track's career he was ever a prominent feature of the periodical meetings. There were often races, indeed, confined to Mercédès cars alone, but Mr. Watney also raced on any other type of car that was good enough for the job, and annexed a large array of prizes.

Indeed, as the last Brooklands' race meet was held on August 3rd, 1914, only the day before war was declared, and as he won, *inter alia*, the "Lightning Handicap," on that occasion, the last important race on the track, he has enjoyed the custody of sundry annual trophies ever since, and these, added to others which he had won outright, make a most formidable show upon his sideboard, and one which it would be difficult to find excelled elsewhere.

A Fine Company.

A few days after war was declared, Mr. Watney obtained a commission in the A.S.C. (M.T. section), and formed and trained himself one of the finest companies ever sent out to the front. They were all skilled mechanics, and their services must have been invaluable at a time when many men were pitch-forked into the M.T. section although they had no mechanical knowledge whatsoever. It was entirely through this laxity of method, in fact, that so many of our lorries were left derelict on the roads of Belgium and France.

As an Examiner.

For a considerable time Major Gordon Watney was engaged in the North in examining candidates for the M.T. section of the A.S.C., a task for which he was peculiarly well fitted by his knowledge of the practical requirements of the case and the intuition which he had displayed in the choice of his own men at the Weybridge works before the war. Even during 1915 there were applications galore for enrolment in the M.T. section from men who could neither drive a car nor handle a spanner, but Major Watney examined the recruits from morn to eve, and saw that none were passed into the M.T. section who were not thoroughly qualified for the work.

Saving £100,000.

In the summer of the following year the excellent resources of the Weybridge factory were called into play in connection with quite a remarkable achievement, as to which the Canadian papers had a good deal to say.

No fewer than 59 motor lorries belonging to the Canadian Contingent on Salisbury Plain had been condemned as unfit for the front or even as scrap, but Major Watney had the whole batch transferred to Weybridge, and there they were one and all overhauled, supplied with new parts where necessary, and finally turned out in workmanlike guise and sent off to the theatre of war. The Canadians were astounded, and it was declared by their journals that Major Watney had saved Canada half a million dollars by this achievement.

Aircraft Engine Repair.

Then, in the early part of 1916, Major Watney left the North Country and, at the request of the War Office, took up the highly important work upon which he has ever since been engaged, and with the fullest measure of success—namely that of the repairing of aircraft engines. He gathered around him a group of the finest engine mechanics in the country, and also addressed himself to the task of enlarging his establishment.

This has since grown nearly ten-fold, and is replete with everything of the best in the way of machines and tools. Beginning with the repair of some Le Rhone motors, the works subsequently grew to be the recognised hospital for Clergets, Gnomes, Beardmores, and R.A.F. aircraft motors which had suffered damage at the front or elsewhere.

Marvels have been accomplished in the way of renovation, and engines that to the eye seem only fit for scrap as the result of shell-fire are expeditiously turned out as good as new, always provided the eternal spare parts problem does not interrupt the process.

A Model Factory.

Seldom, if ever, have I seen anything more pleasing in the way of factory organisation and equipment than was afforded in the course of a tour of the works with Major Watney. The general scheme was excellent down to the minutest detail, and afforded on every hand the most ample evidence of expert management in design and control. As many as 126 engines have been turned out in a single month. Certainly Major Watney has displayed powers in the building up of this new industry even more thaumaturgic than those with which his name was associated in connection with the Mercédès car.

And one thing of which I could not fail to make special note was the air of keenness and capability which every man and woman in the various departments displayed at their work. In this respect there is often a wonderful difference between one factory and another, but at Weybridge it was clear that the whole place was animated by the right spirit of zest for the work in hand and pride in its accomplishment.

Also it was patent enough during my tour of inspection that Major Watney enjoys the full respect and confidence of his many hundreds of workpeople, and equally that he has shown remarkable skill in the selection of his employés. These factors may be held in no small measure to account for the highly satisfactory work by which the firm has become distinguished. It may be added that the canteen and other arrangements for the comfort of the workpeople of both sexes leave nothing to be desired.

Finally it may be mentioned that ere long Messrs. Gordon Watney and Co., Ltd., will be producing standard engines on their own account, an announcement which will in no way be surprising to anyone who has examined the resources of the establishment, and the skill and thoroughness which are manifested in every department of the concern.

GERMANY AND WAR PROFITS.

Writing in the "Morning Post" recently, Mr. Massac Buist touched on a subject which is directly of interest to aircraft manufacturers, namely, that of War Profits, and the German method of dealing with them. How he came by his information he does not disclose, but one may take it that his statements are strictly accurate. Dealing with the great aero-engine firms, the Mercédès, Benz, Oberursel and Austro-Daimler firms, he says:—

"The Daimler-Mercédès, with 8,000,000 marks capital, has doubled its pre-war profit (3,214,168 marks), the profits in the last working year being 6,620,104 marks—over 80 per cent. on the capital employed. During all this time the dividends have risen, starting from 14, proceeding to 16, and then to 25 per cent. How the Germans view their industries is incidentally revealed by the fact that the quotation for the shares is practically a reflection of the profits, having been 328 marks per 100 mark share the year before the war, and 630 marks at the end of this year.

"German policy, of course, aims at enabling their manufacturing enterprises to put themselves in as strong a financial position as possible during the war instead of subjecting them to excess profits duty to the extent that obtains in this country.

"It is not generally known here that the Benz firm is a much larger enterprise than the Daimler-Mercédès, but, as a matter of fact, it has a capital of 22,000,000 marks. The magnitude of the Benz concern is due in a large measure to amalgamations. Though possessing nearly three times the amount of capital that suffices for the Daimler, the Benz firm is to-day making only half the profits, and only two-fifths of the profits made in the pre-war year. On the other hand, the greatest profits so far returned by any of the German motor enterprises was secured in 1914 by the Benz—8,898,549 marks, against 5,012,644 marks in 1913, and 3,019,466 marks in 1915. In spite of this striking diminution of profits, the dividend has risen from 10 per cent. in 1913, to 20 per cent. in the last financial year; and the price of the 100 mark shares from 141.5 marks when the war broke out to 280 marks at the end of 1916.

"The general conclusion to draw from this and from the case of the three next most important motor manufacturing firms in Germany is that the majority of them are conserving their financial resources, and building up very strong positions for the post-war period.

"An interesting sidelight on the dependence of the German air services, no less than our own, upon French engineering genius is furnished by the fact that the Oberursel Motorenfabrik, which manufactures Gnôme aero-engines under licence, and which has a capital of 2,250,000 marks, paid 8½ per cent. dividend in 1913, 12 per cent. the following year, and 35 per cent. in 1915. No later figures are available. The respective profits for these three years were 243,774 marks, 392,865 marks, and 1,619,006 marks. The present price of the 100 mark share is 450 marks.

"Practically all these concerns are continuing to enlarge the scale of their enterprise, a remark which also applies to Austrian motor firms. For example, the Austrian Daimler has increased its capital by 50 per cent. to 12,000,000 crowns, and Graf and Stift by 25 per cent. to 2,000,000 crowns. In Austria these industries are also allowed to retain a large share of their profits.

"That the directors are using them in the proper way is shown by the circumstance that the Austrian Small Arms Co., the largest European manufacturing enterprise of muskets, has set aside 30,000,000 crowns from its huge war profits for a new motor works to start the production of 10,000 cheap, standardised cars a year. In order that it may be independent of the steel producers, the parent firm has bought the entire interest in a steel factory at Gudenburg for 54,000,000 crowns."

A POINT TO NOTE.

A correspondent writes:—

Sir,—I notice in Col. Mervyn O'Gorman's lecture that he does *not* point out the very serious danger which will attend State subsidation of aeroplane making, which he seems to advocate—namely, State interference. There are plenty of people who will, on the one hand, see to it that the subsidy is as small as possible, and, on the other, that the interference is a maximum. This aspect also needs ventilation.—I.S.F.

INSTRUCTION.

On June 26th the ceremonial opening of the West of England instructional factory of the Ministry of Munitions at Bristol took place. Mr. James Currie, director of training munition workers, explained that this factory would be devoted to training and producing parts of aeroplanes, and if it secured a supply of students of the right stamp it would take and teach from 200 to 250 every six or seven weeks.

The students would be chiefly young women, but discharged soldiers and military ineligibles may be engaged if suitable.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THE SOCIETY OF BRITISH AIRCRAFT CONSTRUCTORS

The Production of Aeroplanes and their Components

(Fourth Instalment.)

BY STEPNEY BLAKENEY.

Assembling and Erecting.

The erection of the rear half of the fuselage can now be commenced, and, for the purpose of this article, we can assume that the fittings have been made, and that the swaged tie-rods, fork-ends, and nuts are in stores, also all necessary bolts and nuts.

Owing to the design of the fuselage, the best way will be to assemble the bottom part of the fuselage first in a jig. To do this, it must be built upside down, to permit of the three-ply being glued and screwed down on the bottom side at the rear end.

A jig being a mechanical apparatus for enabling labour to produce interchangeable component and whole parts, it follows that as much care and thought, and sometimes expenditure of time and material, must be spent on it, as the cost of producing perhaps two or three of the required component parts by other methods, which invariably fail in producing repetition work accurately. To start with, ordinary wooden setting-out tables are useless, for however tightly the boards are clamped together, and cross-battened underneath, expansion and contraction always takes place; therefore, until a better method is generally known, it is best to cover the top on which the setting out is done with three-ply about 3-16 in. thick, as the contraction and expansion of this material is negligible, and upon this jig work can be developed and built up.

An Assembling Table.

Therefore, we can proceed to build the table of ¾ in. or 1 in. flooring, well clamped together and screwed to cross battens with about 3 ft. centres, of the same material. It should then be put into the shop, where it is to remain permanently, carefully laid and bedded horizontally on about four trestles, as the length will be about 12 ft. 6 in. long by 4 ft.

There it should, if time permits, be allowed to remain for two or three days to season, after which the top should be carefully tried for level with a straight-edge, in the following manner. Try each side and each end, and try it square across the centre, then diagonally from corner to corner, and make it true to all these tests.

It may then be covered with the three-ply, which should only be screwed down with just a sufficient number of screws to hold it evenly and firmly down to the table. Do not attempt to plane the top surface if uneven. Three-ply, 3/16 in. thick, won't stand this. Take it up and alter the deal boards below.

Having prepared and finished the table, plane one edge of the table, and test it with a straight-edge until it is true. This edge is wanted by the setter-out from which to use his square, and as a base-line. Also, don't trust to squares; only about one in ten is dead true. After you have set out a line at right angles to a base-line, test it. This can be done by the following method, which most men know.

Measure off on the base-line any four units of length, and three of the same units on the line to be checked, the third side or hypotenuse of the triangle should equal in length five units. This is known as the 3—4—5—method, and these units may be inches, feet, yards or miles. The method is based on the old 47th Prop. of the First Book of Euclid, which proves that the sum of the squares of two sides of a right-angled triangle are equal to the square of the hypotenuse, or side facing the right angle. Thus $3^2 + 4^2 = 5^2$, or $9 + 16 = 25$, so the angle between 3 and 4 must be a right angle.

Check these distances with the use of fine trammel points if possible. If this last measure does not meet the extreme points of the other measurements exactly, then the line which is supposed to be at right angles to the base-line is incorrect, and a further check must be made.

Setting Out.

We can now proceed to study the plan of the fuselage, preparatory to setting it out on the jig table. Having done this, the first thing to do will be to find accurately the centre of the table. Mark these points with a soft pencil, then check each of these points from the base-line, or trued edge, of the table. If they are not dead accurate, alter the point so that each point is absolutely the dead same distance from the base-line as the other. This is most important, and if not given minute attention, may cause endless trouble and perhaps cause the bottom part of the fuselage to be so out of square and inaccurate as to necessitate it being scrapped. It may only be ⅛ in. out, perhaps only 1/16 in., but it is wrong, and, as wrong, it will be rejected. Excuses of any kind cannot, and will not, be tolerated.

It is best, owing to the accuracy required, for the setter-out to provide himself with a pocket-knife with a conveniently shaped handle, and, after having found the points approximately with a pencil, to mark all measurements permanently with a fine knife cut, after he is satisfied they are correct. Pencil marking is useless for real accuracy.

Having found the centre of the table at each end, lay a straight-edge along the table and with the pocket-knife draw or cut in once only a fine centre line. You can then go over this with a pencil to make it more clear. Next, set out the position of the true ends of the longerons, where they join up to the front half of the fuselage, then put a line square across the table about 4 in. from one end. This will enable the longerons to be accurately placed in position when the time comes.

It will be well to pencil on this line, for the general information of all concerned, what it is for, to prevent mistakes. From this point, the distance to the centre line of each cross strut should next be marked, and when these are all done, put a square line across, cutting each point.

Next refer to the plan, and from that obtain the cross widths between the longerons at each cross strut. Carefully put a cut line at each end, this will enable you to set the longeron out accurately in plan on the table, and get the correct contour. (See Fig. 8.)

Laying On.

Having done this, lay on one longeron and clamp it to these marks; then the second; after which take a steel tape and accurately check all your distances in between the longerons at each strut, taking care to do this on the centre-line of each strut, and not at the side. The centre line may with advantage be marked in fine pencil on the longeron (cutting with a penknife in this case is not permissible).

Having adjusted any inaccuracies, small pieces of hard wood about 4 in. by 2 in. by 1 in. may be fixed down by means of glue and screws to the table, being gently pressed against the longeron until their position is definite, and the glue sufficiently set. When this has happened they can be further secured by means of a couple of screws.

The position of these distance pieces from either side of the centre line of the strut should be determined by the length of the

FUSELAGE JIG, & COMPLETE PORTION.

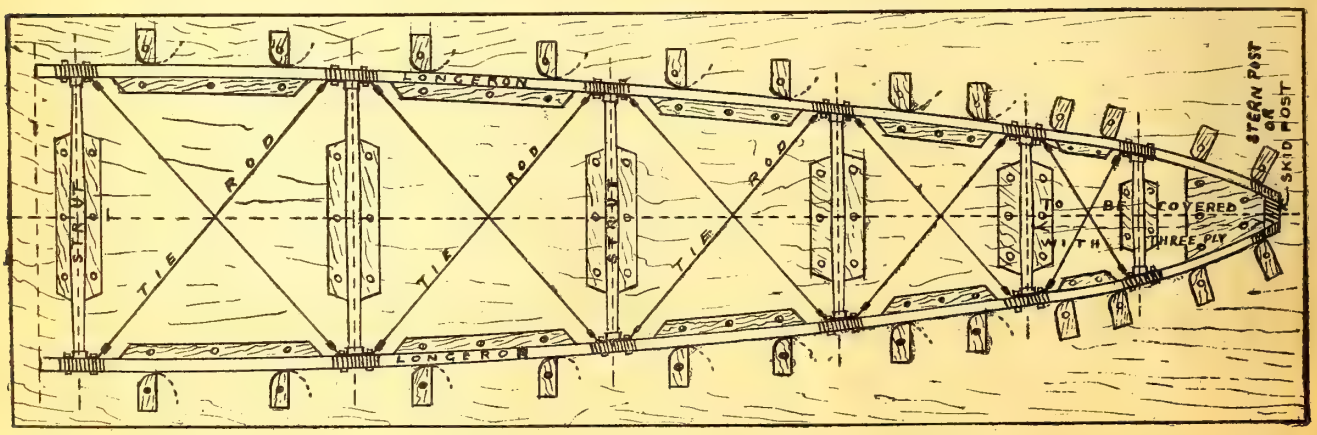


FIG. 8

steel fittings, and a small margin of, say, ¼ in. each side allowed for freedom.

Having fixed all these stops, hard wood turn-buttons should be fixed outside the longeron—(see Fig. 8)—to press it against the stops, when it is being finally fitted, not forgetting to use a piece of three-ply to prevent damage to the longeron. These turn-buttons are desirable on jigs, because they permit of quick release of longerons, struts, and other parts.

Steam Bending.

The bending of the longerons to fit the contour required by the jig will entail the use of a steam-bending plant, using low-pressure steam; preferably about 10 lbs. per square inch.

The steam-box should be long enough to take the whole of the longeron, for it is necessary to steam the whole longeron before bending. Care should be taken that the grain lies vertically when the bend is completed. If this process is not carried out crushing of the fibres will occur, and the strength destroyed.

The steam-bending plant must be close to the jig, for the value of steam-bending will be lost if the longeron is allowed to get cold on being taken out of the steam-box before it is put into the jig. The transference from steam-box to jig should be made as quickly as possible, and the longeron should be allowed to cool in position for a few hours.

Fitting Up.

Having got the longerons laid out on the jig table accurately in position, and all measurements carefully checked, the next thing to do will be to fit the steel fittings on to the struts, taking care in doing so that an equal amount is cut off each end of the strut, measured from the centre, especial care being taken to see that the strut beds accurately and squarely into the fitting. When this has been done the strut should be tested in between the limits of a "length jig" made up to represent a short length of fuselage —(see Fig. 9)—with a sliding adjustment, which can be locked to any required measurement or angle within limits.

A Length Jig.

This kind of jig will be found useful for checking many classes of work, and a few of varying lengths can be made with advantage. They can, of course, be elaborated to suit special requirements.

The strut and steel fittings having been tested for length and found correct, the strut should be tried in between the actual longerons for fit, and it should go in with a gentle pressure. When it is in its final correct position the bolt-holes in the fitting should be very carefully marked off on the longeron for drilling; this can be done with advantage by using a piece of steel exactly fitting the bolt-hole, about 4 in. long, and slightly countersunk, like a rivetsnap, and giving the piece of steel a few light taps to mark the longeron.

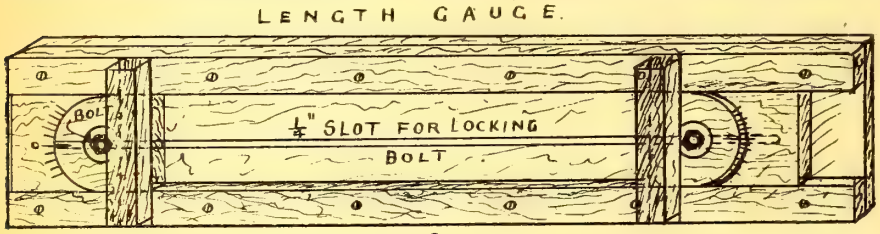


Fig. 9.

This having been done, pencil a distinguishing mark on the strut and on the longeron, so that it will be picked out again and put into the same place in the same fuselage. Preferably use a rubber stamp.

All struts will be fitted in this manner, and after this work is completed, each longeron should have the position of the fittings and the bolt holes marked out for the vertical strut fittings, after which the longerons should be taken out of the jig and the bolt holes drilled on a drilling machine with the aid of a metal plate jig clamped to the longeron to prevent the holes from being drilled out of centre. As no inaccuracies in bolt holes in woodwork are permissible, extra care must be taken with the drilling.

Getting Together.

All the various bolt holes being drilled, the longerons will at once be returned to the erecting shop. Here the longerons, being of spruce, should be neatly bound with ½-in. India tape, tightly laid on after the surface has been well covered with glue, and also the tape, each layer half overlapping the previous one and the end secured by a couple of ⅜ in. by 20 gauge brass gimp pins, after which all surplus glue may be removed with a damp rag. This binding is only required where the steel fittings are placed, and should extend about ½ in. either side.

The longeron will then be replaced in the jig and the final assembly of the rear bottom part of the fuselage will be commenced. It will be best to put in the shortest struts first and work forward, as this method will secure the ends of the longerons having the sharp curves fixed first, and also it will enable another couple of erectors to fit, glue, and screw down the three-ply at the rear end.

Simple Hints.

In bolting the fittings on, it is usual in seaplane work to give the bolts a coat of enamel, and tap them home, to dry in position, as the corrosion by salt water on steel fittings is very severe indeed. This helps to increase their life, and might as well be done in all aeroplanes. In tightening up bolts, it is well for erectors and others concerned to bear in mind that the size of the bolts they are handling are anything between ⅛ in. to 3/16 in. B.A. threads and ¼ in. and ⅜ in. B.S.F. threads, therefore it is not necessary to use a yard of 2-in. gas piping on the end of the spanner as a lever or to send for the "heavy gang" or millwrights, with 14 lb. slogging hammers, to drive the bolts home or lock up the nuts, as such methods are likely to smash the bolt or crush the head or nut into the soft wood. They would also put unnecessary strain on the bolt, and such methods do not find favour with the A.I.D. Also, incidentally, it may cause a man the trouble of having to look for a fresh job, besides proving that he is a B.F. (which stands for blithering fathead, and several other things).

Properly proportioned spanners and box spanners must be provided for the purpose. Tightening up of nuts with pliers and pincers damages the edges of the nuts and generally spoils what might otherwise be good work.

The nuts will now have to be made secure, and the method which now seems to be most universally adopted is to file the bolt down if necessary, until about 1-16th full is left projecting beyond the nut, and then to rivet this carefully over, taking care to hold a suitable piece of iron or steel bar at the back of the head whilst it is done. This riveting can best be done with a small ball-headed hammer weighing about ½ lb.

(To be continued.)

ONE POINT OF VIEW.

Just by way of showing that errors of judgment are not confined to Government establishments, the following letter, from a hand in an engine factory, is of interest:—

Sir,—As a weekly reader of your valuable paper, especially on the present output of aeroplane engines, I would like to ask you a few questions with regard to my present position. Being deeply interested in using my abilities, and to assist as much as possible, I gave up a situation as engine erector and fitter to assist another firm on the same work and the same engine, whose present output is far below normal. I took up my new position three or four months ago and find myself placed so—under a man as head foreman of fitting department, who never saw an aeroplane engine until eight months ago—"a gauge-maker by trade."

Take the following for example: a workman, who is not sure of what he is doing, asks advice, say, from me. I, having done the same work, tell him the best possible way out of the difficulty, and he goes on under my advice until he is seen by the aforesaid foreman. "Who told you to do so and so?" Workman: "Mr. So-and-so." "Well, don't do it. Do it this way." In nine cases out of ten the work turns out "scrap." The result is a replacement order. A new part—loss of time—output delayed, just for this simple matter.

One man can tell a good tale to the management, the other is a "British workman." Now, would you or any other person offer your information a second time after it being turned down? I think not. But I have done this over and over again.

When I say to a workman, "Ask the head man how to do it," ninety men out of the hundred we have in the shop will turn round and say, "I shall be as well off if I ask the errand boy." This is the class of men we have to contend with, yet we read in nearly every paper the great need for aeroplane engines.

Can you tell me the best possible way to go about the present position, as it is a source of worry to one who is deeply interested that our pilots should have no shortage either of engines or material?

[The way out seems to be, to ask for discharge papers and go to some other shop where the manager knows his job.—Ed.]

AERO-MOTORS
IN KIND AND CONSTRUCTION

By Geoffrey de Holden-Stone

Gobé-Diard Charge-Cycle.

At this stage, if anywhere, the closest examination of the sketch-drawing is needed, to see how the i.c. cycle is to work. Yet sufficient will be seen even so, to show that the extensions of the outer half of the crank-chamber, into which the cylinders are socketed, are like those of the Gnôme monosoupape, and of slightly larger diameter than the piston-sleeve, so that they can act as annular transfer passages. Also, that the cylinders have one set of induction ports at the bottom for an enriched mixture, and the crosshead caps another set, to draw air from the crank-chamber.

The piston, on the other hand, has a circle of square-cut ports above its head—which is really its bottom—for the inlet, and another set of oblong ports at the top of its sleeve-extension; which at full outstroke register with similar ports in the cylinder, for the exhaust to atmosphere.

Thus, at its instroke, the piston draws in the rich charge through the conduit between the outer and inner portions of the crank-chamber; this conduit being cut out during the outward or working stroke, when the inlet opening to the conduit ceases to register with the charge-feed port by the rotation of the motor-mass.

Then, of course, as the piston comes down, its underside compresses the primarily induced charge during the whole of the working stroke on its upper side; but to a *progressively increasing compression*, instead of to one or one and a half atmospheres only. But arriving at full outstroke—this action will be seen clearest on the lower part of the illustration—the compressed charge at once doubles round through the short annular transfer and into the ports around the upper side of the piston; thus incidentally helping to blow out the exhaust above.

The exhaust ports open earlier and close later than the inlets so the working chamber has plenty of time to fill with a well-relieved pressure: and so far from being wastefully scavenged, it will be obvious that only the completely burned gases at the top are driven out, any half-used remainder being churned up with the new charge.

Lubrication and Ignition.

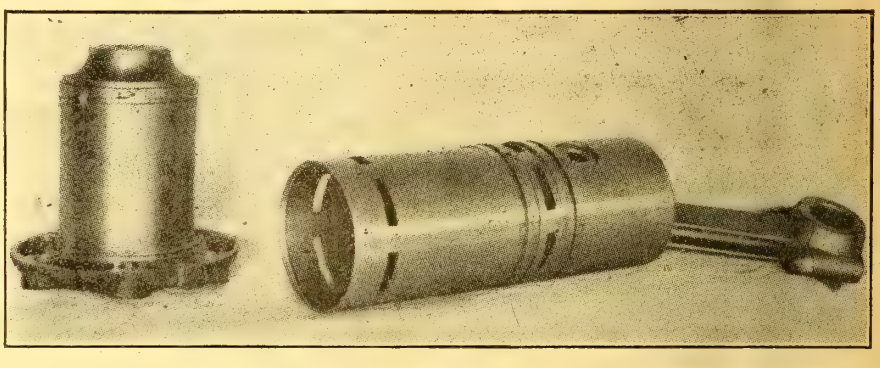
Now, however, arise the questions, not only of lubrication, but the actual charge ignition of the Gobé-Diard. The former is less of a problem in this case than in such sleeve-motors as the Daimler S.K. and their like: for being a rotary, centrifugal action is sufficient to ensure adequate distribution all over the sleeve and cylinder surfaces: especially since the stationary induction trunk affords a convenient entry for the main-oil feed, and the hollow crank-shaft itself an adequate conduit.

The ignition scheme, on the other hand, is less readily perceptible. One might, of course, insert the plugs at the bottom of each pot-like head-piston. But the drawing shows no such indication; and furthermore it does not happen to be done in that way. The actual method is the more interesting, because it is also adopted perforce in other motors—especially one to be described later—of the type in which the piston acts as a sleeve-valve.

This way, then, is the insertion of the plug in the side of the cylinder, at a point opposite full-instroke and compression; where also an oval slot is cut in the sleeve, acting as a window through which the charge can be fired; the length of the slot allowing for full advance or retard. Here the subsequent advantage is that not only do the edges of the slot scour off any excess of lubricant, but the movement of the sleeve itself shields the plug points, and prevents the possibility of their fouling with any combustion products: however indifferent the carburation may be. Thus the chief cause of missed-firing and motor-failure occurring on switching-on after cutting-out the ignition is eliminated, and an additional link established with that reliability which is the first essential of any successful aero-motor.

The Firing Sequences.

The ignition sequence in this case is somewhat curious, though simple enough when the working scheme of the motor is duly followed out. In the case of the 8-cylinder model as shown every other pair of cylinders is at right angles to the next pair. This being obviously so, it will be seen that the pistons of these alternates will be neither at full outstroke nor instroke, but in the midway position owing to the rotation of the motor as a whole. But the motor being of the two-stroke type, it follows that one cylinder of each pair must fire at every half-rotation. Also that one or other cylinder in the alternate pair will be due to fire—on the next quarter rotation—before the opposite one becomes due.



The R.C. Two-Stroke Marine Motor; the original Sleeve and Port Combination.

Consequently—taking the first pair as 12 and 6 o'clock, and the alternates as 3 and 9 o'clock—the firing order of the first four would seem to be 12, 3, 6 and 9. But as the crank-line shows the other four are at 45 degrees, as a set, to the first four. Otherwise we should have a double ignition at the quarter rotation—that is to say, in cylinders Nos. 1 and 5 at the same instant—which would hardly be helpful to a crank-shaft having only end-bearings, nor assist that continuity of rotative effort which naturally corresponds to crank-shaft torque in an ordinary motor.

Actually, then, all these considerations demand an ignition at every eighth of a rotation, somewhere on the line. But here—with due reference to the pistons being in the right position—we have still to consider the old four-cylinder vertical's firing sequence of 1, 3, 4, 2; which leaves the last firing stroke on a middle crank.

So the actual firing sequence for the whole eight—beginning at the top as No. 1, and working round clockwise from four to four—becomes as 1, 5, 2, 6, 3, 4, 8, 7, and so to No. 1 again: the wiring consequently running to each in this order, but *serially* from the distributer plate.

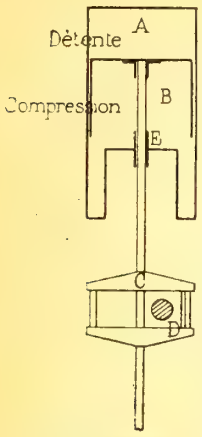
In a 16-cylinder model—which would be quite a practical proposition with four rods to each crank, albeit with a longer crank-chamber—the sequence would run 1, 13, and so to 5, 10, then 6, 3, 11, and so on: the crank for each set of four being in the usual 90 degree relation, but the cylinders in each set staggered just 22.5 degrees from the next, forward or backward, to allow for the sixteenth interval between one working stroke and the next. Also the timing of the magnetos relatively would have to be effected with two 45-tooth spur pinions intermeshed; one of them 22½ teeth in advance of the other, for the same reasons.

Defects and Alternatives.

Nevertheless, the disadvantage of the Gobé-Diard is the outsized length between the cylinder tops. Unless the stroke is to be shortened and the cylinder diameter widened—a reversion to a passing fashion of design of a dozen years ago, and a very doubtful one in the case of a rotary aero-motor—a tremendously wide cowl would be needed to shroud the whole affair. Nothing is gained either, in kinetic effect, for naturally the circle of combustive effort does not extend beyond that area represented by the bottom of the head pistons.

On the other hand, the Berthaud motor—illustrated in working diagram and view of one sectional set on page 36—does appear to offer every advantage—including that of greater mechanical simplicity—that is possessed by the Gobé-Diard, without such excessive length between opposite cylinder crowns. Actually this length is no greater than it would be if the contained pistons were of the differential type, as in the Laviator, even taking the motor as it is, of the fixed radial or "star"-type.

Yet clearly, if the eccentric crank-shaft mounting of the Gobé-



The Berthaud Schema.

Diard were embodied in its design, so as to give rotary mass-motion from fixed cranks, every inch of the length in the Berthaud would have its value in kinetic effect. For the combustion effort circle, being located at the cylinder extremities, would thus be at the full periphery of the mass in rotation.

How the Berthaud Works.

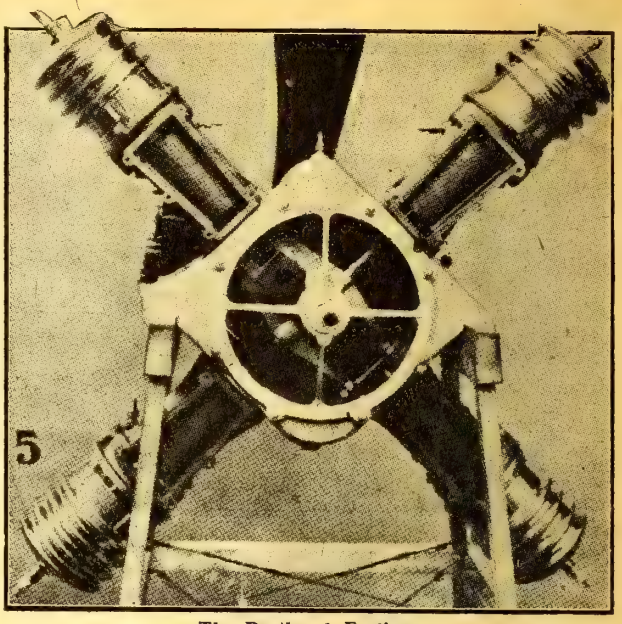
However the Berthaud motor as it is has its cylinders mounted in opposed pairs, each set of four to a common crank-pin, and the charge pumping primary induction, and compression cylinders, formed as shown, in tandem with the working ones.

The line diagram, again, shows the mechanical scheme to be of the simplest order, with this difference from most multi-cylinder two-stroke motors, that each cylinder is self-supplying, as an independent unit. For it will be seen that the *underside* of the long sleeved piston acts as a charge-pump with the minus pressure created by the instroke; which is relieved as soon as the bottom end of the sleeve uncovers the primary induction ports in the cylinder wall—located just below mid-length. These ports are immediately cut out as soon as the piston begins its outstroke, during which the induced charge is compressed upon the head of the stationary piston—clearly shown in the other illustration—and thence transferred upwards to the working or upper side of the piston through a series of inlet ports in the shouldered lower portion of the working cylinder; somewhat in the fashion of the Gnome monosoupape, but in a semi-circle only; the exhaust ports occupying the remainder of the circle at that point. Thus the motor is rendered valveless.

And the Mechanics Thereof.

To obtain this working result, of course, would be impossible with the ordinary connecting rod series, with its lateral movement. Yet the motor being fixed, the crank-shaft must be rotated. Consequently—and here comes in the chief mechanical novelty of the design—rigid piston-rods passing through glands in the stationary piston heads are connected to a box-type cross-head, in which the crank-pin slides to and fro as it rotates.

This construction and method of rod-connection, as used in the Berthaud may or may not be open to objection. If not altogether new—one seems to remember something of the kind at one of the lesser trade-shows in London—it can hardly have been tried sufficiently to be beyond all doubt of its wearing capabilities. The difficulty would obviously lie in its adjustment—at all events with more than a single set of four cylinders—to the same nicety as one expects to get with the crank-pin brasses and cotter-bolts of the conventional arrangement.



The Berthaud Engine.

But on the other hand it may be said that it is easier to true up flat bronze slide-plates than it is to scrape brasses into a dead-cylindrical fit all over; and there is no reason to expect the friction to be worse on their areas than upon the probably larger areas of crank-pin brasses. So the consumption of lubricant should not be excessive at any rate, especially as distributed from the hollow crank-shaft. Whereas in a rotary with the Gobé-Diard crank-shaft mounting duly adopted, the commonplaces of practice would be justified, and if they gave no better result than the average, would certainly display no worse one. Altogether, the Berthaud design is one that appears to present many excellent possibilities, and more than the usual number of effective features as it stands.

(To be continued.)

WHITECRAFT.

Several years ago there lived witches and wizards in the land, and they enjoyed the reputation of being able to do strange things, such as healing the sick and converting stones and base metals into gold. Their machinations were known as witchcraft, and they inspired awe and terror in the minds of the lower classes. At times they were burned at the stake—but that was by the way. Witchcraft was usually associated with certain localities, and there were black and white witches and wizards. Some of the lighter grade were beloved by the poor and needy, for the good works with which they marked their footsteps, but, one and all, they were hated by the priesthood and others in high places, who attributed their works, good and bad, to the devil.

At the present time there has arisen in and around the parish of Richmond a cult which seems as if it must be a reincarnation of witchcraft on a higher plane.

This manifestation is known as Whitecraft, and it certainly possesses the wonderment of witchcraft, but the more sinister elements have naturally disappeared in the lapse of centuries.

Two years or so ago, in May of 1915, to be precise, Mr. J. A. Whitehead, fortified by considerable practical experience in various aircraft workshops, formed a small company at Richmond for the purpose of building aeroplanes.

A small wooden drill hall was acquired, and, with a miniature staff, the place was adapted to the needs of an aircraft works.

The organisation in all its branches was personally conducted by Mr. Whitehead, and his activities were difficult to describe.

A semi-comic, semi-tragic photograph exists of the early morning's work in Mr. Whitehead's office, where the managing director is shown successfully conducting half-a-dozen operations at once, including eating his breakfast, shaving himself, answering the telephone, dictating a letter, and receiving a telegram, with skill which only M. Paul Cinquevalli would attempt.

The success which this effort enjoyed was undoubtedy due in no small measure to Mr. Whitehead's striking personality and to the way in which he handled his employees.

As an experienced aircraftsman, he was able to take off his coat and show any erring workman how to perform any operation quickly and well, and he has always kept those who work for him well reminded that there is now a war on, and work to be done. The motto which crops up at all corners, "There's no fun like work," must have inspired many with enthusiasm for a hobby which is at once amusing and profitable.

Having thus demonstrated his manufacturing abilities, Mr. Whitehead was able to increase the capital of the company, and to build new works in 1916, which had the distinction of being opened by Sir Charles Cheers Wakefield, of Castrol fame, who was then Lord Mayor of London. A symbolical drawing, showing Sir Charles casting off flocks of Whitehead aeroplanes in the manner of a falconer, was used to adorn the programme of events, and attracted much comment at the time.

A large house was also acquired as a club for the firm's employees, and forthwith it became known as the Whitecraft Club. This institution was intended to make things more easy for employees. Run on a self-supporting basis, the Club is as dear to its old members as the Pickwick Club in Dickens' days.

Alongside the Club is an enormous canteen, whose construction was hung up by the local authorities for many weeks on aesthetic grounds, where well-cooked meals are served, under hygienic conditions, at a most moderate price. Like everything else, the catering is done at home, and when the price of meat became a problem, the firm acquired a butcher's shop in Richmond in order that wholesale prices might be obtained!

Of late, Whitehead enterprise, to quote the late Mr. Sam Weller, has been "wisibly swellin'," and extensions have been made in all directions. A large park in the vicinity of Richmond has been acquired, and workshops are in full working order. An enormous aerodrome is being levelled out, and it is hoped in the future to convert the mansion, which is at present being used as a military hospital, into a club-house.

Of the work that is in progress it is naturally indiscreet to speak. One can merely say that it reflects the man.

Mr. Whitehead fully appreciates the uses to which women can be put in aircraft factories, and large numbers are employed, many of them upon operations of great delicacy.

Mr. Whitehead at home is typical of Whitecraft. He at present occupies Buccleugh House, Richmond, where he preaches the gospel of a big air fleet and the possibilities of commercial aviation in a way which the multitude can understand.

MARKET REPORTS.

Prices given are for quantities on usual terms.

COPPER.—The market is very quiet indeed. Of course all dealings are entirely under official control, with the consequent elimination of nearly all merchant business. Supplies are very regular and there is every indication that future demands for war purposes will be easily met.

Current Prices.

Copper Ingot (Standard) Cash...£130 per ton.
Copper Sheet ....£165 per ton.
Copper Tube .....20½d. per lb.
Brass Sheet, 24 G. .....16⅛ per lb.
Brass Tube, S.D. .....17d. per lb.

TIN.—There is still a very uncertain tone about this market. The fluctuations during the last few weeks have been very erratic and are worth recording (see below). The recent advance approached £250 and then collapsed, a sharp decline bringing the price down to £242 (29.6.17). Good supplies have recently been received from the States and orders are fairly well covered .

June 4th. 6th. 8th. 11th. 13th. 15th 18th. 20th.
£239. £237. £238. £236. £236. £240¾. £249. £246
June 22nd. 26th.
£246. £242.

LEAD.—The position is still unaltered, and supplies are very scarce. There is a very strong feeling that the present difficulties have been created by incapable officials. Official prices are unaltered, being £29 10s. to £30 10s. per ton.

STEEL.—Prices are very steady and a reduction is very unlikely. Before any business can be done with U.S.A., there must be a substantial reduction in prices. In view of the unprecedented congested condition of all mills, consumers are looking well ahead and considering the unlikelihood of a decline in prices. This is certainly a very wise procedure. There is a very acute shortage of Tool Steels, and there is no indication that an improvement is in sight.

Current Average Prices.

R.A.F. 3B Steel, 38s. to 40s. per cwt. Basis.
R.A.F. 1E Steel, 78s. to 80s. per cwt. Basis.
R.A.F. 9A Steel, 32s. to 33s. per cwt.

ALUMINIUM.—This market still remains unaltered.

Current Official Prices.

Ingot £225
Remelted ... ... £210 ...

TIMBER.—The demand for aircraft timbers, in common with other aero materials, is rapidly increasing, but unfortunately supplies do not show any improvement. The Admiralty is now in a position to supply constructors with Silver Spruce, Walnut, and Mahogany, at the following prices:—

Silver Spruce, £85 per standard.
Propeller Walnut, 2s. 3d. s.ft. to 2s. 6d. s.ft.
Propeller Mahogany, 1s. 9d. s.ft. to 2s. s.ft.

One is surprised to learn that firms are expected to take the wood without inspection, especially considering the unfavourable report received of the quality of the timber imported. One is strongly of the opinion that this stipulation must be withdrawn.

Current Prices.

Silver Spruce, 17s. c.f.
English Ash, 13s. 6d. to 15s. c.f.
Walnut, 2s. 3d. to 2s. 6d. s.f.
Mahogany, 2s. 2d. to 2s. 4d. s.f.

FABRIC.—There is very little to report. Supplies are now coming through more rapidly. There was a delay a few weeks ago due to the weavers turning out more cloth than the bleachers could deal with; apparently our official experts had increased the number of weavers working on aircraft fabrics, but overlooked the bleachers, and a state of congestion followed when the fabric reached the latter.

Prices are unaltered.

Official Prices (reported).

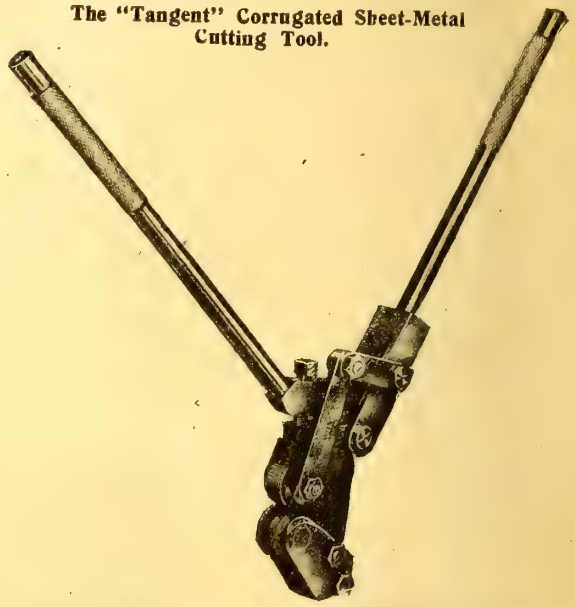
17C Cloth, 29½d. per yard, 36 in. wide.
17C Cloth, 31d. per yard, 38 in. wide.

SHEET METAL CUTTING.

Now that so much sheet metal is used in aeroplane work, aircraft constructors will welcome a device which will assist its ready manipulation. A clever range of sheet metal cutting tools has been produced by Montgomery, Smith and Co., Ltd., of Tangent Works, Keynsham, Somerset.

The ordinary sheet metal cutting hand shears and bench shears of the scissor type have possessed the merit of simplicity, but they had the disadvantage that the expenditure of considerable power was required in proportion to the work done, and the long blades of the shears are a source of annoyance when complicated cutting is undertaken.

The "Tangent" Corrugated Sheet-Metal Cutting Tool.



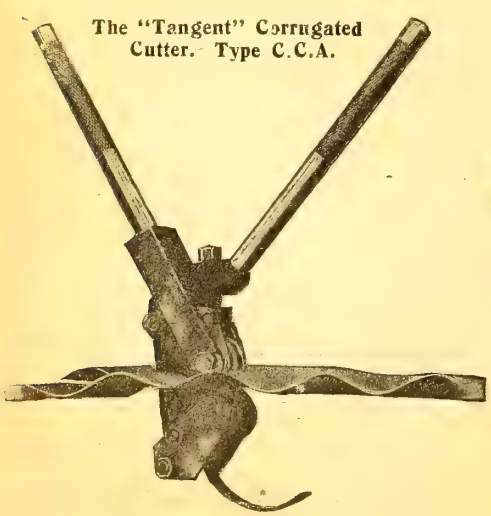
Type C.C.B. **Capacity 18 gauge.**

The range of sheet cutting tools manufactured by Montgomery, Smith and Co., Ltd., is known as the "Tangent" series, and the various models are designed for differing work.

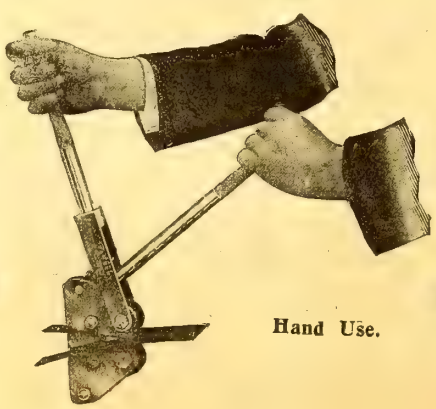
Type H.P.C. is a small tool capable of cutting sheet steel up to 3/32 in., and softer metals up to ⅛ in. Two patterns are made, one intended for the bench, and the other for purely hand work. As a matter of fact, the hand model can be converted into a bench tool in a few minutes.

The tool comprises a pair of rotary double-edged cutters, serrated or knurled round the shearing edges. The upper cutter

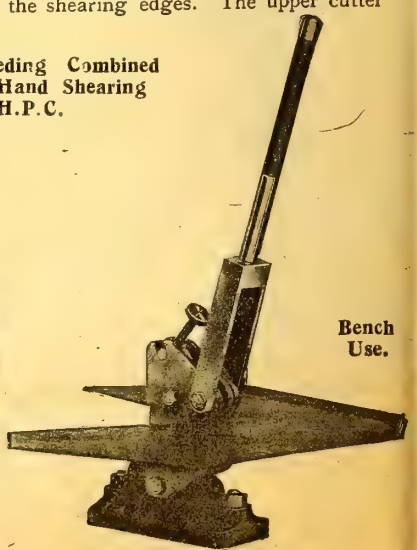
The "Tangent" Corrugated Cutter. Type C.C.A.



The "Tangent" Self-Feeding Combined Portable and Bench Hand Shearing Tool. Type H.P.C.



Hand Use.



Bench Use.

is driven by means of an internal ratchet by operating the forked handle backwards and forwards. The tool is self-feeding, and the cut can be stopped at any point across the sheet.

Type B.C.H. is constructed on similar principles to type H.P.C., but is of much heavier and stronger design and has compound variable leverage. This tool will cut steel up to 3/16 in. thickness and softer metals up to ¼ in.

A slightly differing range of tools has been produced, but constructed upon very similar principles, which are designed to cut corrugated iron in a straight line, on a curve, or obliquely across the sheet without distortion. The heavier models of this pattern are also arranged with compound leverage.

Complete information about the devices is contained in an illustrated leaflet issued by the firm, and those interested are recommended to apply for a copy, mentioning The Aeroplane.

THE PATENTS INDEX.

The subjoined list of recent inventions has been specially compiled by The Aeroplane from the current Official Patents Records.

Patent Applications.

Abbott, G. Toy flying machines, etc. No. 9067. June 23rd.
Adams, J. A. Device for detecting inclination of aircraft. No. 8816. June 19th.
Aeronautical Instrument Co. Balloons. No. 9054. June 23rd.
Anderson, D. Aeroplanes, hydroplanes, etc. No. 8956. June 21st.
Barr, A. Height-finders for anti-aircraft gunnery, etc. No. 8990. June 22nd.
Berrisford, W. H. Device for indicating angle of inclination of aeroplanes. No. 8832. June 20th.
Brotherhood, C. Aeroplanes. No. 8829. June 20th.
Brown, H. Aeroplane flight-angle and lever indicator. No. 9027.
Croucher, S. J., and another. Detecting and indicating direction of aircraft. No. 8809. June 19th.
Gillespie, W. E. Level or indicator for aircraft. No. 8744. June 18th.
Glass, W. Aeroplane control gear. No. 8766. June 19th.
Gledhill, A. H. Apparatus for releasing bodies from aircraft. No. 9009. June 22nd.
Homer, E. Angle indicator for aircraft. No. 8716. June 18th.
Leyland Motors, Ltd. Internal-combustion engines for aircraft, etc. No. 9069. June 23rd.
Maison Breguet. Chronotelemetrical apparatus for regulating firing of anti-aircraft guns. No. 8744. June 18th.
Maison Breguet. Chronotelemetrical apparatus for regulating firing of anti-aircraft guns. No. 8755. June 18th.
Portholme Aerodrome, Ltd. Wings of flying machines and method of construction thereof. No. 8846. June 20th.
Roesch, G. Liquid-fuel containers for aircraft, etc. No. 8820. June 19th.
Roots, J. D. Flying machines. No. 8805. June 19th.
Vickers, Ltd. Landing device of aeroplanes. No. 8955. June 21st.
Weguelin, G. C. L. Propellers for aerial machines. No. 8928. June 21st.
Westaway, J. C. Propelling or lifting device for aircraft. No. 9002. June 22nd.

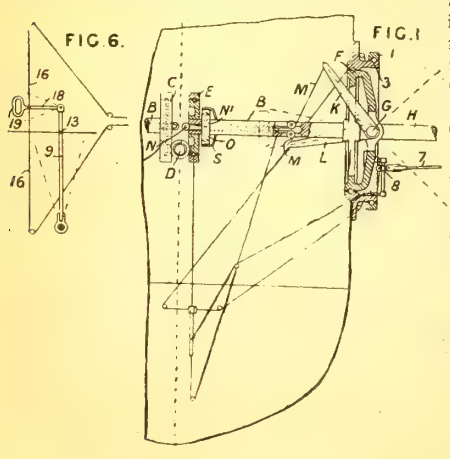
Complete Specifications Accepted, Prints of which are obtainable on and after July 12th, 1917.

107,050. June 12th, 1916. Sloper, T. Pneumatic cushioning-devices for aircraft.
107,099. July 17th, 1916. Wilson, T. E. C. Flying machines.

Abridgments of Recently Published Specifications.

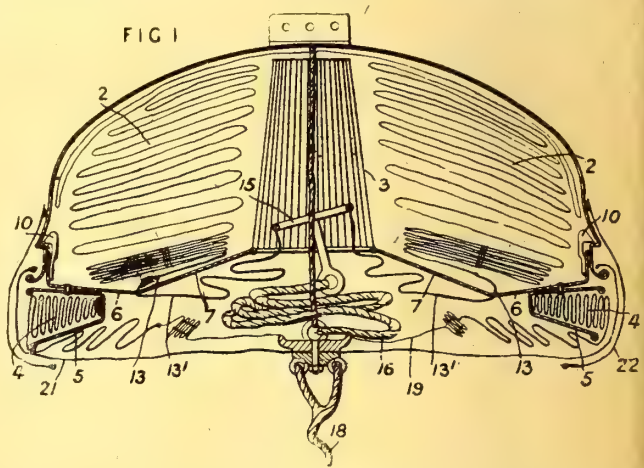
105,816. Aircraft. Saunt, W. F., Lundy Island, North Devon.

Propelling; Steering.—An aerial machine of the kind described in Specification 14862/15 has (1) means for varying the angle which the inclined extension makes with the main driving-shaft, (2) means for varying the angle of incidence of the wing, and (3) means for varying the opening and closing movement of the wing, all controlled from a single hand-lever capable of three motions., (1) The main driving-shaft B of each wing is supported in bearings E, F, and the two shafts have worm-wheels C driven from a common worm D. The extension H working inside the hollow humerus of the wing is pivoted to G and has two arms K, L connected to a cord M which passes into a hollow in the shaft B and over a pulley N. One point of the cord is connected to a pin N^1 passing through a slot in the shaft B to a sleeve O adapted to slide on the shaft. The sleeve O turns in a sleeve adapted to be moved by a forked lever S so as to vary the inclination of the extension H. Separate sleeves adapted to be moved in opposite directions may be connected to separate cords M instead of forming the cord into a loop, and one of the sleeves may be inside the shaft. (2) The gimbal mounting of the humerus is carried by a ring 1 adapted to turn on a bracket 3 fixed to the body. A rod connects the lower fork of the humerus to an adjustable slide on the body, this arrangement producing an independent cyclical variation of incidence. According to the Provisional Specification, the rod may be connected directly to the ring 1, in which case there is no cyclical variation of incidence. (3) A rod 7 connects an extension of the ulna of the wing to a slide 8, or two cords connected to the ulna at opposite sides of its pivot may be used. The controls (2) and (3) are available when the machine is used as an aeroplane, the shaft H under these circumstances being turned into alignment with the shaft B so that the wing is not affected by rotation of the shaft. The three controls are operated by the lever device shown in Fig. 6. A lever 9 universally jointed at its lower end is connected at 13 to horizontal lateral and longitudinal cords led respectively to the pivoted lever S and slide 8 of controls (1) and (3). A lever 18 having a handle 19 is pivoted to the upper end of the lever 9 and operates a vertical cord 16 led to the adjustable slide of control (2) either directly or through multiplying-gear acting on a leading-screw and nut. The above described controls may be used in conjunction with the tail control described in Specification 102,915.



105,944. Parachutes. Calthrop, E. R., Eldon Street House, Eldon Street, London.

In order to ensure the opening of a parachute, such as that described in Specification 21312/14, an auxiliary parachute is arranged to open first and thus to collect and conduct air into the main parachute. In the form shown, the main parachute 2 is folded within a container 1, being arranged around a cage or support 3 connected by spokes 7 to an annular plate 6, which carries an annular member 5 for housing the auxiliary parachute 4, and is secured to the container 1 by pawls 10. The apex of the auxiliary parachute is attached to the member 5, which thus constitutes a central opening. The rigging 13, 13^1 of the main parachute is attached to the plate 6 and connected by a centre-piece 15 and rope 16 to the main suspension rope 18 secured to the aviator; the rigging 19 of the auxiliary parachute is connected also to the rope 18. Covers 21, 22 enclose the apparatus. When the load comes on the rope 18, the cover 21 is stripped off and the auxiliary parachute is opened, after which the pawls 10 are pulled out of engagement, thus releasing the cage 3 from the container 1 and unfolding the main parachute, which receives the air entrapped in the auxiliary parachute.



S.B.A.C. MEMBERSHIP.

The Davidson Aviation Company, Ltd., intimate that the firm has now been elected to Membership of the British Aircraft Constructors.

THE AEROPLANE BUYERS' GUIDE.

ACETYLENE WELDING PLANT—
Imperial Light, Ltd., 123, Victoria St., S.W.

AEROPLANE MANUFACTURERS—
Aircraft Manufacturing Co., Ltd., 47, Victoria St., S.W.
Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds [Norwich
Boulton & Paul, Ltd., Rose Lane Works,
British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol
British Caudron Co., Ltd., Broadway, Cricklewood, N.
Central Aircraft Co., Palmerston Works, High Rd., Kilburn, N.W.
Curtiss Aeroplane Co., L. J. Seely, Clun House, Surrey St., Strand, W.C.
Davidson Aviation Co., Ltd., Hammersmith, W.
Eastbourne Aviation Co., Ltd., Eastbourne
Grahame-White Aviation Co., Ltd., London Aerodrome
Handley Page, Ltd., 110 Cricklewood Lane, N.W.
Mann, Egerton & Co., Aircraft Works, Norwich
Martinsyde, Ltd., Brooklands, Byfleet
National Aircraft Co., Ltd. 15, Hackney Rd. N.E.
"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2.
Norman-Thompson Flight Co., Ltd., Bognor
Roe, A. V., & Co., Ltd., Manchester
Sage, F., & Co., Ltd., Peterborough
Saunders, S. E., Ltd., East Cowes, I.O.W.
Short Bros., Rochester, Eastchurch and Whitehall House, S.W. [Thames
Sopwith Aviation Co., Ltd., Kingston-on-
Standard Aircraft Manufacturing Co., Effingham House, Arundel St., W.
Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.
Waring & Gillow, Ltd., Hammersmith
Westland Aircraft Works, Yeovil
White, J. Samuel, & Co., Ltd., East Cowes

AIRSHIPS—
Airships Ltd., 47, Victoria St., S.W.
Short Bros., Rochester, Eastchurch and Whitehall House, S.W.

ALUMINIUM CASTINGS—
Coan, R. W., 219, Goswell Rd., London, E.C.
Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. [Rugby
Willans & Robinson, Ltd., Victoria Works,

ANNEALING FURNACES
Fletcher, Russell & Co., Ltd., 15 Fisher Street, Southampton Row, W.C.

BEARINGS (Etonia Cast Phosphor Bronze)—
Yorkshire Engineering Supplies, Ltd., Wortley, Leeds

BORRODIZING—
The Deptford Steel & Iron Works, Ltd., 1 and 2, Old Pye St., Westminster

BRASS SHEETS FOR TIPPING PROPELLERS—
Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3.

BUILDINGS—
Boulton & Paul, Ltd., Rose Lane Works, Norwich [S.W.
Fairby Construction Co., Ltd., 117, Victoria St.,
Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey [Wall
The Wilfley Co., Ltd., Salisbury House, London

CARBURETTORS—
Hobson, H.M., Ltd., 29, Vauxhall Bridge Road

CASTINGS—
Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3.

CASTINGS (Aluminium)—
Coan, R.W., 219c, Goswell Road, London, E.C.
Willans & Robinson, Ltd., Victoria Works, Rugby

CELLON DOPE—
Cellon Ltd., Broad St. House, New Broad St., E.C.2

CLOTHING—
Burberry's Ltd., Haymarket, S.W.
Dunhill's, Ltd., Euston Rd., N.W.
Hazel & Co., 4, Princes St., Hanover Sq., W.
Robinson & Cleaver, Ltd., Regent St., London

COMPONENT PARTS—
Accles & Pollock, Ltd., Oldbury, Birmingham
B. D. V. Aircraft Spares, Syon Chambers, 16A, Kew Road, Richmond, Surrey
Central Aircraft Co., Palmerston Works, High Rd., Kilburn, N.W.
The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland

CORDS, TAPES AND THREADS—
MacLennan, J., & Co., 30, Newgate St., E.C.1., and at Glasgow

DOPES—
British Aeroplane Varnish Co., Ltd., Milburn House, Newcastle-on-Tyne, and 166, Piccadilly [S.W.
British Cellulose Co., Ltd., 8, Waterloo Place,
Cellon, Ltd., Broad St. House, New Broad St

ELASTIC CORDS—
Tubbs, Lewis, & Co., 29 & 30, Noble St., E.C.2.

ELECTRICAL ACCESSORIES—
The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex

ENGINES AND PARTS—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford
Arrol-Johnston, Ltd., Dumfries
Beatty School of Flying, Ltd., London Aerodrome
Beardmore Aero Eng., Ltd., 112, Great Portland Street
Dudbridge Iron Works, Ltd. (Salmson), 87 Victoria St., London, S.W.
Gordon Watney & Co., Ltd., Weybridge
Green Engine Co., Ltd., Twickenham
Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W.
Sturtevant Motors Co., 147, Queen Victoria St.
Sunbeam Motor Car Co., Ltd., Wolverhampton
The Gnome & Le Rhone Engine Co., Ltd., 47, Victoria St., S.W.
Willans & Robinson, Ltd., Victoria Works, Rugby

FLYING SCHOOLS—
Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth
Dutton Aircraft, Chester Aerodrome, Chester

GALVANISING—
Cowper-Coles Manufacturing Co., Sunbury-on-Thames [Norwich
Boulton & Paul, Ltd., Rose Lane Works,

GEARS—
Moss Gear Co., Ltd., Thomas St., Aston, Birmingham

GLUE—
Adams & Co., Ltd., West Bromwich
Improved Liquid Glues Co., Ltd., Gt. Hermitage Street. (Croid.)
Mendine Co., 8, Arthur St, E.C.

GOGGLES—
Triplex Safety Glass Co., Ltd. 1, Albemarle St. Piccadilly, W.1.

GYROSCOPES—
The Sperry Gyroscope Co., Ltd., 15, Victoria St., London, S.W.

HEATING AND VENTILATING—
Comyn, Ching & Co., Ltd., Castle St, Long Acre, W.C.
Chas. P. Kinnell & Co., Ltd., 65 & 65a, Southwark St., London, S.E.1.

INSTRUMENTS—
British Wright Co., Ltd.. 33, Chancery Lane

MACHINE TOOLS—
Bliss, E. W., Co., 2a, Pocock St., Blackfriars Rd., London, S.E.
Brewster & Co.. 11, Queen Victoria St., E.C.

MAGNETOS—
The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry

METAL MANUFACTURERS—
Chas. Clifford & Son, Ltd., Birmingham

METAL PARTS AND FITTINGS—
Accles & Pollock, Ltd., Oldbury, Birmingham
Aircraft Supplies Co., Ltd., 17, John St., Theobald's Road, W.C.
Bayliss, Jones & Bayliss, Ltd., Wolverhampton (Bolts and Nuts)
The Birmingham Guild, Ltd., 45, Gt. Charles St., Birmingham
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds
Foster Engineering Co., Wimbledon
Mann, Egerton & Co., Ltd., Aircraft Works, Norwich
Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham
Rubery, Owen & Co., Ltd., Darlaston
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire
Selsdon Engineering Co., Ltd., Croydon
Thompson Bros., Ltd., Bradley, Bilston

METALS IN GENERAL—
Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3.

METRIC BOLTS—
Cashmore Bros., Zota Works, Hildreth St., Balham, S.W.

MISCELLANEOUS—
Anderson, D., & Son, Ltd. (Roofs), Belfast
Anti-Glare Glass Co., Ltd., 78, Turnmill St. E.C.
Bowden Wire, Ltd., Willesden Junction
Brown Bros., Ltd., Great Eastern St., E.C
Edison Swan Electrical Co., Ponders End (Lamps)
Herbert Frood Co., Ltd, Chapel-en-le-Frith
Glasso Manufacturing Co., Ltd., 211, City Rd., E.C.
London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid
MacLennan, J., & Co., 30, Newgate St., E.C.1. and at Glasgow. Tapes, Cords and Threads

OBSERVATION PANELS
Triplex Safety Glass Co., Ltd., 1, Albemarle St., Piccadilly, W.1.

PACKERS, SHIPPERS, etc.—
Lep Transport & Depository, Ltd., Castle St., Long Acre, W.C.

PATENT AGENTS—
King's Patent Agency, 165, Queen Victoria St.
Page & Rowlingson, 27, Chancery Lane, W.C.
Stanley, Popplewell & Co., 38, Chancery Lane

PISTON RINGS—
British Chuck & Piston Ring Co., Coventry

PROPELLERS—
Blackburn Aeroplane and Motor Co., Ltd. Olympia, Leeds
Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames
Integral Propeller Co. Ltd. Hendon
Lang Propeller, Ltd., Weybridge
Oddy, W. D., & Co., Leeds
Westland Aircraft Works, Yeovil [Norwich
Boulton & Paul, Ltd., Rose Lane Works,

RIGGING FOR AIRCRAFT—
Cradock, G., & Co., Ltd., Wakefield, England

"ROYAL EDISWAN HALF WATT TYPE LAMPS"—
The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex

SAFETY BELTS—
C. H. Holmes & Son, 38, Albert Street, Manchester

SAND AND DIE CASTINGS—
Coan, R. W., 219, Goswell Rd., London, E.C.

SCIENTIFIC INSTRUMENTS—
The Foster Instrument Co., Letchworth, Herts

SEAPLANE MANUFACTURERS—
Blackburn Aeroplane and Motor Co., Ltd. Olympia, Leeds.
The Norman Thompson Flight Co., Ltd., Middleton, Bognor
Short Bros., Rochester
Supermarine Aviation Co., Ltd., Southampton

SEATS FOR AEROPLANES—
Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Telephone, Central 3473

SHEET METAL PRESSINGS
Accles & Pollock, Ltd., Oldbury, Birmingham
Blackburn Aeroplane and Motor Co., Ltd. Olympia, Leeds
Jacobs, W. A. & R. J., Ltd., 94 & 96, Leonard St., Finsbury, E.C.
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham
Nicholls & Lewis, Ltd., 16, Princep St., B'ham

SHOCK ABSORBERS (Elastic Cord)
Tubbs, Lewis & Co., 29 & 30, Noble St., E.C.2

SPARKING PLUGS—
Forward Motor Co., Summer Row, Birmingham
Hobson Manufacturing Co., 29, Vauxhall Bridge Rd., S.W.
Lodge Sparking Plug Co., Ltd., Rugby
Ripault, Leo, & Co. Ltd., (Oleo Plugs), 64a, Poland St., W.

SPRINGS—
Dart Spring Co., West Bromwich

STEEL—
Nicklin, Bernard, & Co., Birmingham
Firth, Thos., & Sons, Sheffield

STEEL TENSION WIRES—
Cradock, G., & Co., Ltd., Wakefield, England

STEEL TUBES for AEROPLANES—
Accles & Pollock, Ltd., Oldbury, Birmingham

TAPER PINS—
Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham

TAPES AND SMALLWARES—
John MacLennan & Co., 30, Newgate St., E.C.1. and at Glasgow
James North Hardy & Son, Ltd., 54, Portland St., Manchester.

TIMBER—
Engineering Timber Co., Ltd., 9, Victoria St., London, S.W.
Owen, Joseph & Sons, Ltd., Borough High St., London, S.E. [Nottingham.
R. F. & F. W. Brown, Wollaton Saw Mills, nr.

TIME RECORDERS—
Gledhill-Brook Time Recorders Ltd., 26, Victoria St., S.W.

TYRES AND WHEELS—
The Beldam Tyre Co., Ltd., Brentford, Middlesex
The Palmer Tyre, Ltd., Shaftesbury Avenue

VARNISHES—
Jenson & Nicholson, Ltd., Goswell Works Stratford, E.15
Naylor Bros., Ltd., Southall, Middlesex
Willesden Varnish Co., Ltd., Hythe Rd., Willesden Junction, N.W.

WELDING REPAIRS—
Barimar, Ltd., 10, Poland St., W.

WIND SHIELDS—
Auster, Ltd., 133, Long Acre, W.C.
London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid.
Triplex Safety Glass Co., Ltd., 1, Albemarle St., Piccadilly, W.1.

WIRES AND CABLES (Aeroplanes)—
Cradock, Geo., & Co., Ltd., Wakefield

WOODWORKING MACHINERY—
Sagar, J., & Co., Ltd., Halifax
Wadkin & Co. Leicester

(Continued from page 26.)

ROBERTSON.—Lt. John Ross Robertson, Yeo., attached R.F.C., youngest son of Sir William and Lady Robertson, Dunfermline, was killed in action on May 12th.

SHEEHAN.—Capt. D. D. Sheehan, Nationalist M.P. for Mid Cork, has been notified that his son, Lt. D. J. Sheehan, R.F.C., previously reported missing, is now unofficially reported as dead.

STACEY.—Sec. Lieut. Douglas W. Stacey, R.F.C., who died of wounds on June 20th at the New Zealand Stationary Hospital, was the youngest son of the late John E. Stacey, of Dorset, and Mrs. Stacey, of 4, Glendower Place, S.W. He was born at Sherborne in 1885, and was educated at Merchant Taylors' School, London. For the last 10 years he had been gold-mining in Rhodesia, four of them in tributing the "Godwin" mine. He came to England last year to volunteer for the R.F.C., and proceeded to France on May 30th of this year.

SULMAN.—Sec. Lieut. Geoffrey Sulman, R.F.C. (temporary instructor), died on June 20th, at the Military Hospital, Lincoln, as the result of an accident. He was the eldest son of John and Annie E. Sulman, Sydney, Australia, and was aged 23 years.

* *

A letter from his squadron commander states that Lieut. John William Shaw, R.F.C., is a prisoner in the hands of the Germans. Mr. Shaw was officially reported missing after a flight over the German lines during the capture of the Messines Ridge on June 7th, and he was last seen engaged in a fight with two enemy machines. Mr. Shaw is a well-known oarsman. He rowed for the Marlow R.C. from 1909 to 1914, and was in the eight which did so well at Henley in 1913 and 1914.

ENGAGEMENTS.

HALL—WELLS-COLE.—A wedding will shortly take place between Capt. G. H. Hall, Yeomanry and R.F.C., eldest son of Sir Henry Hall, I.S.O., and Lady Hall, of Chester, and Miss M. G. Wells-Cole, younger daughter of the late G. F. Wells-Cole and Mrs. Wells-Cole, of Stanes Place, Lincoln.

JENSEN—PALMER.—An engagement is announced between Lt. J. Jensen, R.F.C., only son of Mr. J. Jensen, of Westerham, Kent, and Gwynifrid Barrington, eldest daughter of Mr. and Mrs. T. H. B. Palmer, of 1, Sutton Court, Chiswick, late of The Ivy House, Bushey.

LITHGOW-BALFOUR.—An engagement is announced between Major Ernest Lithgow, R.A.M.C. and R.F.C., eldest son of Dr. T. G. Lithgow, of Farnborough, and grandson of the late Colonel the Hon. Ernest Curzon, 52nd, Oxfordshire, Light Infantry, son of the first Earl Howe, and Doris, elder daughter of Colonel A. M. Balfour, D.S.O., R.F.A., and Mrs. Balfour, of The Close, Tetbury, Gloucestershire.

MARRIAGES.

BAILLIE—ALLAN.—On June 30th, 1917, by special licence, at Regent Square Presbyterian Church, Lieut. Archibald Baillie, R.F.C., late of the Black Watch, elder son of Mr. and Mrs. John Baillie, of Glasgow, was married to Ann, elder daughter of Mr. and Mrs. Henry Allan, of 31, Clerkenwell Green, London, by the Rev. Ivor J. Robertson, M.A.

COX—WARNER.—On June 23rd, at St. Andrew's Church, Westminster, Major G. H. Cox, North Staffs. Regt. and R.F.C., was married to Eileen, youngest daughter of Mr. and Mrs. Aucher Warner, 193, Ashley Gardens, S.W.

DE COURCY—WRIGHT.—On June 21st, at Holy Trinity Church, Sloane Street, by special licence, Capt. John Arthur Gerald de Courcy, R.F.C., M.C., Croix de Guerre, only son of the Hon. R. C. S. and Mrs. de Courcy, of Waipukurau, N.Z., and Exeter (and nephew of the Hon. Mrs Millar, Killarney Wood, Bray, Wicklow), was married to Anna Felicia, youngest daughter of the late Mr. Justice Wright and Mrs. Wright, of Rycroft, Bray, Co. Wicklow.

FULLER—FULTON.—The marriage took place on July 2nd, at Holy Trinity Church, Sloane Street, of Capt. Charles Drury Fuller, Royal Sussex Regt., and R.F.C., son of Mr. and Mrs. Herbert Fuller, 31, Palace Court, W., and Miss Beatrice Fulton, daughter of Sir Robert and Lady Fulton, of 7, Sloane Gardens, S.W. The bride was given away by her father. Miss Manson and Miss Mathew (cousins of the bride) were bridesmaids, and Miss Diana Skimming (niece of the bridegroom) carried the bride's train. Capt. N. B. Fuller, brother of the bridegroom, was best man.

GILLING—CHAPMAN.—On June 23rd, at St. Michael's, Golder's Green, N.W., Capt. A. C. Gilling, R.F.C., was married to Marjorie Gillam, only daughter of Mr. and Mrs. H. Chapman, Lillington, Ambrose Avenue, N.W., by the Rev. V. Keelan.

STEEL—HENDERSON.—On June 28th, Sec. Lieut. Graham Strang Steel, R.F.C., only son of the late Thomas Steel, was married, by special licence, at St. Bartholomew's Church, Southsea, by the Rev. S. C. Lowry, to Marion Chalmers, only daughter of the Rev. James Henderson, 26, Victoria Grove, Southsea.

WILKES—HEWITT.—On July 1st, at St. Mary Magdalene's, Wandsworth Common, S.W., Sec. Lieut. Henry James Trevor, R.F.C., elder son of Mr. and Mrs. William H. W. Wilkes, of Belmont, Kidderminster, was married to Doris Margaret, only daughter of Mr. and Mrs. Alfred Hewitt, of Lena Lodge, Balham Park Road, S.W., by the Rev. C. V. Rowe.

BIRTH.

TIZARD.—On June 25th, at Portland House, Woodbridge, the wife of Capt. H. T. Tizard, of a son.

Capt. T. Davidson, Cameron Highrs. and R.F.C., has been missing since June 19th. News of him will be gratefully received by his sister, 14, Melville Street, Edinburgh.

* * *

It is reported that Sec. Lt. M. Kaiser, R.F.C., is a prisoner in Germany. Mr. Kaiser is a son of the headmaster of the Jews' Hospital and Orphan Asylum.

* * *

It has been arranged that Brigadier-General L. E. O. Charlton, R.F.C., is to open on July 4th (to-day) a hostel provided by the Eccentric Club for disabled soldiers, as a memorial to the late Captain Ball, V.C.

It is in Mare Street, Hackney, and among those attending the ceremony are Alderman Ball, the Mayor of Nottingham, the Recorder of Nottingham, Sir A. Griffith-Boscawen (of the Pensions Ministry), Sir Charles and Lady Wyndham, Sir Frederick Milner, and many other distinguished people.

The members of the Eccentric Club have subscribed over £10,000 for the Captain Ball hostel and three similar places designed for the benefit of discharged disabled soldiers who are attending courses of instruction at the various polytechnics and technical institutions in London.

* * *

As a result of Miss Helen Morris's matinée at Wyndham's Theatre on June 19th, a cheque for £400 has been handed to Lady Henderson to provide comforts for the R.F.C. in the Near East.

FRANCE.

OFFICIAL COMMUNIQUÉS.

JUNE 26th.—ARMY OF THE ORIENT.—The Allied aviators successfully bombed numerous enemy camps.

JUNE 27th.—Yesterday, about 8 p.m., German aircraft dropped several bombs on Nancy. There were no casualties, and no material damage was done.

JUNE 28th.—A German aeroplane, brought down by one of ours, fell to the south of the Bois de Beau Marais, south of Craonne. The pilot, who was wounded, and the observer, who was unhurt, were captured.

The Germans continue to bombard Reims, which to-day received 1,200 shells. Eight fell on the Cathedral.

It is confirmed that on June 25th an Albatros attacked by one of our aeroplanes fell into its own lines east of Gratreuil. Yesterday an Albatros was brought down south-east of Moronvillers.

JUNE 29th.—ARMY OF THE ORIENT.—British aviators caused big explosions and fires at Sovjak, near Demirhissar, and among the sheds at Bogdand.

* * *

Sous-Lt. Dorme, the famous French pilot, who received the Legion of Honour, the Médaille Militaire, and the Croix de Guerre, for bringing down 23 German aeroplanes, is officially reported as missing.

* * *

Lieutenant-Aviateur James Hall, author of the popular volume, "Kitchener's Mob," is reported to have been killed on the French front during an encounter with several German aeroplanes. He was born in Boston, Mass., and was a member of the American Lafayette Escadrille.

GERMANY.

OFFICIAL COMMUNIQUÉ.

JUNE 29th.—Yesterday, the flying camp at St. Denis Westrem, near Ghent, was bombed.

* * *

A semi-official telegram of June 30th from Berlin states that the German Press, referring to the British and French indignation at the air attack on the "fortress" of London, says:—

If England wants to spare civilians she can remove them from the immediate neighbourhood of storing places for war requirements. Folkestone, Dover, Sheerness, and London are such storing places.

The German people, under the pressure of England's starvation war, have become a hard race with an iron fist. England has felt this, and will experience it again to-morrow. England may lie, deceive, threaten. The hammer in our fist will fall unmercifully and shatter places where England forges her weapons against us. So it shall certainly be.

A participant in the recent aeroplane raid on London contributes to the "Frankfurter Zeitung" a graphic story of the expedition. After describing the journey out, he says :—

Now it is a straight course for London. The first shots of the anti-aircraft guns reach our height, but don't disturb us. The firing having been passed, our squadron closes up. On the left is the Thames, whose bends we follow carefully on the map.

At last, surprisingly clear and distinct, so that everything can be recognised, London's sea of houses beneath us. Our first greetings drop in quick succession—more still more. Then we proceed, coolly and calmly, passing over the suburbs, for it is the centre we must hit. We regard nothing but that one object. There are the Tower, Liverpool Street Station, the Bank of England, Admiralty ships on the Thames—all are absolutely clear. Everything is before us. Now is the moment. I press the bomb-release handle and follow intently the course of the greetings of the German people to the English. They are plentiful, blow after blow bursting bombs in the heart of England.

[On this point the "Vorwärts" (the Socialist organ) says :—"It is necessary to remark that the writer of this article discharged a military order but no political mission from the German to the English people. A military action in which, unfortunately, non-combatants and women and children also lost their lives, cannot suitably be described as greetings from the German to the English people."]

A wonderfully impressive sight. Over the centre of London, high up between us, the bursting shells of batteries; down below exploding bombs, clouds of smoke and fires. Over us all the smiling sky. The squadron turns. A last glance at the city—auf Wiedersehen!

Describing the return journey, the writer relates how he was attacked by British fliers. After boasting that he beat off two opponents, he says :—

Then comes the third, who is an obstinate, clever fellow. For ten minutes we exchange shots. He makes a sudden bitter attack, and we are hit in the wings. Then the enemy machine rockets down into the depths, the first enemy beaten on England's island. Then we are over the coast. To the right is an enemy flier, whom, from his tactics, I recognise as a trained flier of the Somme battles. Perhaps we had previously met each other. We are ready. Here he is. Suddenly he makes a turn to the left, in a flash is twenty metres nearer, and in a moment both machine-guns are at work—thirty seconds only, for a fight which was short and sharp—a meeting of old friends of last summer. We recognise each other.

* * *

It is reported that Lieut. Allmenröder, a member of Capt. von Richthofen's "travelling circus," has been killed while fighting on the Western front.

Lieut. Allmenröder was first officially mentioned on May 26th, when he was credited with having brought down two enemy machines and thus achieved his 19th and 20th victories. His last appearance in the reports of German Main Headquarters was on June 6th, when he was said to have again secured a double victory, and to have brought up the number of enemy machines accounted for by him to 26.

* * *

The "Frankfurter Zeitung" reports the death of the German aviator Riessinger, who had, before he met his fate, shot down four enemy machines.

The report adds that during his last fight he succeeded in setting fire to the machine of his British opponent, but the latter, seeing that he was unable to escape death, rammed Riessinger's machine, with the result that both aviators fell to the ground.

AUSTRIA.

OFFICIAL COMMUNIQUÉ.

JUNE 30th.—Enemy aviators dropped several bombs in the vicinity of Trieste.

ITALY.

OFFICIAL COMMUNIQUÉS.

JUNE 26th.—Aircraft were very active yesterday. One enemy machine was brought down by battery fire and fell within its own lines north of Asiago.

During the night our aircraft bombed the military works at Nebrasina and Prosecco. All the machines returned safely.

JUNE 29th.—Enemy aviators displayed great activity during the evening. They were effectively engaged by our anti-aircraft batteries.

JULY 1st.—It is announced that on the night of June 29th a squadron of enemy aeroplanes, coming from the sea and flying at a great height, dropped incendiary and high explosive bombs on the lagoon of Venice, on the city itself, on Murano, and Chioggia.

Fortunately there were no casualties. The raiders made off under a heavy fire from our anti-aircraft batteries, and it is believed that two of the machines were hit.

Reprisal measures were promptly taken, and on Saturday night our seaplanes attacked the industrial zone of the town of Trieste. The attack was carried out in spite of a heavy storm which had suddenly sprung up and a heavy fire of the enemy batteries.

All our machines returned to their bases.

* * *

A message from Naples reports that the first aeroplane with mails for Sicily left there that morning at 6.24, and arrived at Palermo at 9.25. It was to return that evening to Naples with mails from Sicily.

* * *

There has been on view at Padua for the benefit of the Soldiers' Clubs, that Austrian seaplane which wrought such havoc on the city in Nov. last and caused more than 100 deaths.

The machine (K.301), which has a fearsome history of misdoing—being responsible, too, for the damage to the basilica at Aquileia—was brought down in Grado lagoon. She is a fine speciman of current Austrian practice, spans 21 metres, and has a 12-cylinder 300-h.p. engine. The length of the boat-body is 12½ metres by 1½ metres beam, and it is judged by those who ought to know that the machine could carry a useful load of close on a thousand pounds. A regular naval engagement took place over the possession of the wreck, so probably our Allies have got a good thing.

INDIA.

JUNE 30th.—A statement communicated by the Secretary of State for India, referring to the rising on the North-West Frontier, says :—

Our aeroplanes raided Makin and Marobi with considerable effect.

TURKEY.

OFFICIAL COMMUNIQUÉS.

JUNE 26th (apropos action between the "Breslau" and Russian Naval Squadron).—One of our seaplanes dropped bombs with effect on some of the enemy ships of the line . . . Finally, the portion of our naval forces in question, as well as our aeroplanes, returned without having suffered any damage.

JUNE 29th.—Three enemy machines which attacked Jerusalem on June 26th (? were brought down). Our reconnoitring patrols, which were approaching two of these machines, having again been attacked by enemy aeroplanes, captured the machine-guns of these aeroplanes and burnt the machines.

The British have lost six aeroplanes, two in air fights and four by our artillery fire. The activity of our aviators on the Sinai front is worthy of admiration, and deserves to be recorded.

GREECE.

A message from Salonika on June 23rd states that an unusual number of air reconnaissances by single machines have been made lately, the enemy taking advantage of the mists which are frequent at this season of the year.

SWEDEN.

A message from Ystad states that on June 2nd two Zeppelins violated Swedish territorial rights. They approached from the East, and were only two nautical miles from the shore when the Swedish destroyer "Pollux"—the vessel which last year, with her guns ready for action, drove off some German submarines which were trying to seize a British steamer within the territorial limit—opened fire on them with guns and rifles. The airships made for the open sea, the crowds which witnessed the incident cheering as they departed. A Zeppelin has also travelled over Swedish territory at Simrishamn.

It is reported, in connection with this incident and with the recent attack on a Swedish aviator by some German seaplanes, that the coast of Scania for some time has been systematically patrolled by the Germans, who, it is stated, are looking for some British steamers which they expect to intercept when they leave the Baltic.

The "Aftontidningen" declares that the next step will probably be the taking by Germans from the air of Swedish life on Swedish soil.

"Aftonbladet," a journal with strong pro-German tendencies, says :—Germany is again giving our people cause for resentment. The attack on one of our aviators is a serious breach of international law from more than one point of view, and we must emphasise the point that Sweden does not intend to refrain from asserting its rights as a neutral State, according to international law, and that it will not be satisfied merely with the explanation that when navigating in the air mistakes are easily made.

The paper further points to the fact that Germany is the only belligerent Power which during the present war has been guilty of shedding the blood of innocent Swedes.

DENMARK.

The special correspondent of the "Morning Post," writing from Copenhagen on June 4th, says :—

The brutality of the methods employed by Germans against neutral ships was emphasised to-day in the Maritime Court by the crew of the Danish steamer "Odense." The crew stated that the vessel had called at a British port for inspection, and was proceeding on her voyage, when, on May 5th, a torpedo was suddenly fired at her. The torpedo missed its mark, whereupon a German submarine appeared and opened fire. The crew took to the boats, but the submarine continued to shell the steamer

and the boats for twenty minutes. The "Odense" was hit thirty times, while, of the men in the boats, two were killed and two seriously wounded. The vessel and her crew were saved by a British seaplane, the appearance of which caused the submarine immediately to submerge.

U.S.A.

The report of the duration and distance traversed by the aeroplanes with General Pershing in Mexico has just been published.

From July 1st to Dec. 31st, 1916, the machines of this unit carried mail on one trip in each direction between Colonia Dublan, Mexico, and Columbus, New Mexico, without missing a trip. The average time for this 110 miles was 66 minutes, and the machines were forced to rise to an altitude of 4,100 ft. above Columbus and 8,200 ft. above sea level. The total flights for this unit from Jan. 1st to Dec. 26th were 7,087. The machines were in the air for a total of 3,356 hours, and travelled a total of 251,775 miles. Of fatalities there were none.

* * *

Details of the trial flights of DN—1, the first United States Army airship, which is the product of the Connecticut Aircraft Company of New Haven, Conn., have been received. The flights were made at Pensacola, Florida.

Leaving the floating hangar at the aeronautic station at 5.0 o'clock on April 20th, the DN-1 ascended to a thousand feet altitude, headed across the bay, sailed over Santa Rosa Island, circled over Pensacola, and returned to the yard.

The trial flight, which was made by the company's pilot, Hans O. Stagel, and crew, was to test buoyancy, speed, and ascertain a number of technical points.

Two landings on water were made and ascent and descent were accomplished by ballonette steering, no gas being lost from bag to make descent.

Rebuilt several times, the DN-1 in its present form was produced under direction of Mr. C. F. Smyth, general manager of the company, who took hold of the management of the company's affairs last July.

The DN-1 reached Pensacola last December, and work of assembling and erection was begun in January, under the supervision of General Manager Smyth, and the company's pilot, Hans O. Stagel, was placed in charge of the work. Its capacity is eight men.

* * *

An unofficial trial of the first of 16 non-rigid airship coast scouts ordered by the Government from a design by Naval Constructor J. C. Hunsaker, of the Bureau of Construction and Repair, has recently successfully been made. It consisted of a flight of about 400 miles between Chicago and Akron, O.

The news leads the Navy Department to expect to have the entire 16 airships at work along the Atlantic coast by the middle of August. Crews for their operation are being trained at the naval aeronautical station at Pensacola, Fla. An older type of airship is being used for the purpose.

The airships are built after the British "Blimp," which has proved of value in the detection of submarines while approaching the English coast. The American airships will be operated in pairs from special bases ashore, and will be expected to serve as the "eyes" for submarine chasers. They will be fitted with wireless.

The Government gave out contracts for the building of nine of these airships by the Goodyear Rubber Company, and seven others are being turned out by the Goodrich Rubber Company, the Curtiss Aircraft Company, and the Connecticut Aircraft Company.

The trial was made by the first product of the Goodyear Company. The Government specifications are for a speed of forty miles an hour. About thirty miles an hour was made.

* * *

It is reported that the production of the Hispano-Suiza 8-cylinder aviation engine has now reached about 10 a week at the Wright-Martin factory in New Brunswick, N.J., the old Simplex plant. It is expected that production will be steadily increased to at least 10 engines a day by the end of the year, and the aeroplane factory will be easily able to keep pace with the engine production or even to exceed it. To date about 40 engines have been sent to France, the first passing the French Government test, and proving to be interchangeable in every detail with the engines made in French factories. The engine produces 150 h.p. at under 1,500 r.p.m., and in a recent test a machine fitted with one of these engines attained 9,700 ft. in 15 minutes, getting off the ground in 5 seconds, with a passenger as well as the pilot.

* * *

It is reported from Mineola that an escapade in which two mechanics deliberately disobeyed orders by taking into the air one of the instruction machines at Mineola ended disastrously on May 7th, when Pte. Ransome H. Merritt and Pte. Anthony P. Spilener were killed. The two young men, over-ambitious about acquiring a knowledge of aeroplane handling, took advantage of the fact that they had been ordered to prepare one of the L.W.F. biplanes for the day's instruction. Without permission they took the machine into the air, and after a half hour's thrilling gyrations one of the wings collapsed and the machine crashed to earth, killing both of the occupants.

AIRCRAFT IN THE HOUSE.

On June 27th **Major Baird** (Rugby, U.), replying to **Mr. Pemberton-Billing** (Hertford, Ind.), who asked whether any complaint had been received regarding the type of machine supplied to the air pilots on service with the British troops in Mesopotamia, said:—I am not aware of the receipt of any communication on this matter which could with correctness be described as a complaint. The Commander-in-Chief in Mesopotamia has stated that he would like certain additions to the aeronautical equipment of his forces, and his wishes in this respect are being met.

Mr. Pemberton-Billing: Is the hon. gentleman aware that the German Government have discovered our *ruses de guerre*, and are we making this a dumping-ground for our worst "dud" machines?

Colonel C. Lowther (Cumberland, Eskdale, U.): Will an opportunity be given for the discussion of the Mesopotamia scandal?

The Speaker intervened, and no further answer was given.

The Chancellor of the Exchequer, replying to **Colonel Claude Lowther** (Cumberland, Eskdale, U.), who asked whether the refusal to entertain any organised system of reprisals was due to the fact of their impracticability or to the Government's antipathy to methods which they considered barbarous, said: I can only refer my hon. friend to the answer which I gave yesterday.

The Chancellor of the Exchequer, in reply to **Mr. Pemberton-Billing**, again declined to give an early date for a debate on our Air Services, policies and administrations.

Mr. Pemberton-Billing: Is the War Cabinet, the Government, or this House responsible to the people for the conduct of the policy of this country?

The Chancellor of the Exchequer: The War Cabinet is responsible to this House, and between us we are responsible to the people.

Mr. Pemberton-Billing: Will the right hon. gentleman give this House an opportunity of expressing its views or at least the views of the country?

The Chancellor of the Exchequer: I have answered questions of this kind, I think, once a day for 10 days, and I have said more than once that if there is any general desire to discuss the question an opportunity will be given.

Colonel C. Lowther: Are we to understand that the bombing of our cities, the murder of women and children, and other acts contrary to civilised warfare are to go on for ever unpunished?

The Chancellor of the Exchequer: Not if we are able to stop them.

Sir G. Cave (Kingston, Surrey, U.), replying to **Mr. Pemberton-Billing**, said the Field-Marshal Commanding-in-Chief established some time ago a system of night warnings of air raids which covered the whole country and had worked well, and he had now established a system of day warnings in the area exposed to attack by hostile aeroplanes. In both cases the warnings were conveyed to the proper military and police authorities and to certain factories and institutions where special precautionary measures were required in the public interest; no public warning was given by the military authorities. In certain areas public warnings were prohibited by military order, and the Government had now decided that no public warnings should be given in London, but elsewhere local authorities were allowed to give such warning if they thought it desirable.

Mr. Pemberton-Billing, in the course of a supplementary question, answered by **Major Baird**, said the question was put to the Prime Minister; it was one of policy and not for a "political under-strapper" to answer. Subsequently **Mr. Billing** was putting a further question, when **Sir S. Roberts** (Sheffield, Ecclesall, U.), asked whether a Minister was obliged to answer an hon. member who had used offensive expressions towards him.

The Speaker: It is not the way, of course, to get an answer. (Laughter.)

* * *

The House having gone into Committee, **Dr. Addison** delivered a lengthy address upon the work of the Ministry of Munitions, in which the following reference to aircraft production occurred:

When early in this year the Ministry was asked to undertake the supply of aeroplanes and seaplanes for the Army and the Navy, it became evident that the mobilisation of all our resources for the production of internal combustion engines under a unified scheme of direction was essential. The production of all internal combustion engines is now under the direction of Mr. Martin, who left the B.S.A. Company and the Daimler Motor Company to join the Ministry for this purpose. By a continued effort to diminish the number of types and to concentrate on the best, with a policy of securing that one shop shall be devoted to the production of only a single type of engine, we have already obtained an enormous increase in production, apart from the addition either of machinery or labour.

At the same time, I asked Sir William Weir, who had done

such good work for us as Director of Munitions for Scotland, to take charge of the supply of aeroplanes and seaplanes. He and Mr. Martin became members of the Air Board and of its Technical Committee, not only as representatives of supply, but so as to establish a close working relation between the manufacturing side and the formulation of programmes and designs which properly belongs to the Air Board.

Under Sir William Weir's direction, the increase in the output of aeroplanes is already rapidly increasing. The production for May is more than twice that of December, and the supply by Christmas will be vastly greater than it is now. This Department makes a particular demand on skilled workers, and our increased production of aeroplanes depends mainly upon an adequate supply of skilled workers.

MILITARY SERVICE. EDITOR OF "THE AEROPLANE."

The following question stood on the Paper in the name of **Mr. Churchill** on July 2nd :—

64. To ask the Under Secretary of State for War whether his attention has been called to the fact that Mr. C. G. Grey, editor, part proprietor, manager, and director of THE AEROPLANE, aged forty-one years and seven months, and previously marked unfit for military service, has now been medically classified as C2 on examination by the Westminster Tribunal; and whether, having regard to the value and importance of THE AEROPLANE newspaper as a means of interchanging knowledge between all branches of our rapidly extending Air Services and affording a supply of valuable, technical and other information to the officers and men and to Mr. Grey's exceptional knowledge of all matters connected with aviation from its earliest beginnings, he will place the editor of this technical and Service paper in the same position as is recognised in the case of the editors of political daily papers?

Mr. Billing: On behalf of my right hon. friend, I beg to ask question No. 64.

Mr. Macpherson: This case is under consideration by the tribunals, and must be left to their decision. In the special circumstances, however, the military representative has been instructed not to press for Mr. Grey to be made available for military service.

Sir W. Collins: Is it in order for an hon. Member to ask a question for another Member without his consent?

Mr. Speaker: I assumed, naturally, that the hon. Member had the consent of the right hon. gentleman. Otherwise I presume that he would not ask the question.

THE AERONAUTICAL SOCIETY OF GREAT BRITAIN.

The following have been elected to the Aeronautical Society :—

Fellows.—F. W. Lanchester, M.Inst.C.E.; Dugald Clerk, D.Sc., F.R.S.; Lt.-Col. Mervyn O'Gorman, C.B.

Associate Fellows.—Lt.-Col. R. K. Bagnall Wild, G. H. Handasyde, T. G. John, A. W. Judge, H. P. Martin, R. Borlase Matthews, R. Richardson, Capt. T. E. Robertson, F. R. Smith, T. O. M. Sopwith, W. G. Carter, F. Sigrist, Capt. W. S. Farren, Lt. Norman Barrett, Capt. F. S. Barnwell, E. G. Walker, R. H. Verney, W. H. Allen, L. W. Bryant, W. H. Barling, Dr. J. E. Ramsbottom, Thos. Jones, C. W. Alexander, J. M. Heesem, Comdr. W. Briggs, H. B. Irving, R. A. Bruce, Capt. H. Grinsted, J. G. Florence, E. Spencer, H. Knowler, Lt. H. E. Wimperis, W. Brierley, G. P. Bulman, F. T. Hill, A. S. A. Ormsby, W. E. Dommett, C. H. Brooks, S. H. Smith, J. D. Scaife, H. T. Tizard, J. B. Blondeau, K. Secretan, E. G. Cole, H. C. Fuller, G. H. Hales, C. H. Powell, J. R. Pannell, R. Chadwick, E. Robinson, O. P. Monckton, G. E. Barnhart, O. W. Thomas, A. A. Remington.

Student Members.—A. J. T. Ireland, W. H. Lyne, H. Yendall, W. E. James, J. Williams, L. S. Flatman, R. K. Heysham, J. N. F. Morris, R. W. Sutton, Joseph Shepherd, V. W. Derrington

Members.—Brig.-Gen. D. Pilcher, N. G. Gwynne, Lord Cowdray, Col. W. B. Caddell, F. M. T. Lange, J. H. Newton, Miss E. M. L. Wade, C. G. Gourlay, W. J. Skevington, Major A. H. Burgoyne, M.P., B. Wortman, H. S. O'Brien, H. T. Vane, R. F. Rowbotham, H. Knox, H. Noel, J. P. H. Bewsher, A. Boake, R. C. Searle, H. G. Wells, E. H. Dyson, Lt. W. R. Dainty.

Associate Members.—D. M. Sullivan, S. Holroyd, Lady Jenkins, R. G. Laws, J. N. P. Morris, J. B. Phillips, R. C. Carver, Mrs. St. John, A. Davidson, W. Thorpe Haddock, W. Chater Lea, D. Mooney, F. J. Poynton, Miss A. Freeland Squire, C. W. Mayne, E. Scott.

THE FIRST PRIZE COURT AEROPLANE CLAIM.

On July 2nd, the Right Hon. Sir Samuel Evans made a grant of prize bounty to the officers and crews of H.M.S. "Severn" and "Mersey" for the destruction of the German cruiser "Königsberg" in July, 1915. Commander Maxwell H. Anderson, R.N., appeared in support of the motion. The occasion was remarkable in that the claimants included the officers and men of the R.N.A.S. operating the two aeroplanes used.

Counsel said that with regard to the pilots and observers of the aeroplanes, they belonged to the R.N.A.S., and were lent to the "Severn" and the "Mersey" for these operations. They were on the books of the monitors, and he submitted that they formed part of the crews of those vessels and were entitled to share in the prize bounty.

The President, in giving judgment, said :—The only new feature in this case is that application is made also on behalf of the officers and men who were serving in the aeroplanes to be included among those who are entitled to have prize bounty granted and distributed. The officers and men of the two aeroplanes belonged to the Royal Naval Air Service, and it is admitted that they were attached to the "Mersey" and the "Severn" for these operations; and it is clear from the report that the services rendered by them were of a very valuable kind. I think that I am acting well within my powers in deciding that the officers and men belonging to the two aeroplanes, for the purpose of section 42 of the Naval Prize Act, 1864, formed part of the crews of the "Severn" and the "Mersey."

I pronounce and declare, therefore, that the officers and ships' companies of the "Severn" and the "Mersey" and the officers and the men of the two aeroplanes were present at and assisted in the destruction of the armed ship "Königsberg," belonging at the time to enemies of His Majesty, and that at the beginning of the engagement there were on board the "Königsberg" 384 persons, and therefore the amount of the prize bounty payable at the rate of £5 per head is £1,920.

CONDOLENCES.

Sec. Lt. John Spencer Dunville, Dragoons, who has died from wounds received in action, was the second son of Mr. John Dunville, of Redburn, Holywood, Co. Dublin, and of Sion, Co. Meath, who is now a squadron commander Royal Naval Air Service, and was for some time political secretary to the late Duke of Devonshire.

The young officer who is now dead was 21 years of age last May. He had held a commission in the Dragoons since Jan. 1st, 1916.

His father and mother are among the pioneers of aeronautics in this country, having been enthusiastic balloonists for a number of years, and having done most valuable work in the foundation of the Aero Club, amongst whose members they are most highly esteemed and respected. To them all concerned with aeronautics will tender the deepest condolences in the loss of their son, and will regret the loss to the King's Service of so promising an officer.

A TELEGRAPHIC ADDRESS.

It should be noted that the telegraphic address of the British Emaillite Co., Ltd., of 30, Regent Street, S.W.1, has now been changed to "Ridleypren," Piccy., London, and customers are requested to make the necessary alterations in their files in order to save delay by incorrect telegraphic address.

AN HONOUR.

One is pleased to record that Mr. W. Lionel Naylor, Director of Naylor Bros., Ltd., who has been on active service in France since the beginning of the war, has been awarded the Meritorious Service Medal for "valuable services rendered with the Armies in the Field."

THE SOPWITH SPORTS CLUB.

Under the auspices of the Sopwith Cricket and Lawn Tennis Clubs an al fresco concert and dance took place on the "O.K's." sports ground on Saturday evening, June 23rd. Unfortunately the temperature was most uncongenial for an open-air function, but in spite of the cold wind a good number patronised the concert, the majority occupying seats in the shelter of the stand. Mr. Alfred Smith, who arranged the programme, secured the services of his Penrhyn String Orchestra.

At a late hour in the evening dancing commenced, and many devotees enjoyed a full programme, for which the Penrhyn orchestra again provided the music. Mr. V. W. Derrington, hon. Secretary of the tennis club, carried out the arrangements, and Mr. R. E. Edwards proved a capable M.C.

AN ACCIDENT.

Many readers will regret to learn that Mr. H. Sykes, the well-known Whitehead Aircraft pilot-tester, met with a mishap on June 25th while flying at the Hanworth Park Aerodrome.

He was testing a new Scout machine when the engine failed The latest news to hand reports that he is making satisfactory progress, and all will wish him a speedy recovery.

A BARGAIN SALE.

The lady readers of THE AEROPLANE will do well to note that a special summer sale is being held by Robinson and Cleaver, Ltd., at the Linen Hall, 156-168, Regent Street, W.1., which will continue throughout July.

The absence of an "Aunt Jemima" on the staff of THE AEROPLANE makes the publication of technical details of the various goods impossible. Those interested should apply to the firm for a catalogue.

Incidentally, one gathers that there are a number of bargains of interest to officers in the Royal Naval Air Service and the Royal Flying Corps.

THE TRAINING OF AERONAUTICAL ENGINEERS.

By R. MULLINEUX WALMSLEY, D.Sc., F.R.S.E., and C. E. LARARD, M.I.C.E., M.I.M.E.

On Wednesday, June 27th, a paper was read to the Aeronautical Society by Dr. R. Mullineux Walmsley, the Principal of the Northampton Institute. The following pages include the paper as read, plus sundry portions omitted in the reading.

Mr. A. E. Berriman took the chair in the unavoidable absence of Sir Edward Busk. He said that education is itself a subject requiring as careful and laborious study as any other topic which had been discussed by the Aeronautical Society. The true significance of this fact was not sufficiently appreciated. We should understand the importance of trying to lay the foundations of technical education truly and well. He paid an eloquent tribute to the work done by the Northampton Institute.

Dr. Walmsley said :—

In winding up with the paper of this evening a highly successful session of the Aeronautical Society of Great Britain, the authors desire to express their appreciation of the honour of being invited to conclude the series of lectures and papers delivered during the last six months. They hope they will not be misunderstood when they venture to affirm that, both in the planning of the course to cover practically every section and in the high level of excellence of the individual papers, the present necessities and the future of the science and practice of aeronautics have been admirably served. And to-night we reach as a fitting climax, because of its direct bearing on development in the immediate and still more in the distant future, the all-important subject of the education of our aeronautical engineers, that is, the education of those who are to follow in the footsteps of the readers of the preceding papers and their coadjutors and of those on whose fitness in the widest sense of the word the future of aeronautics in this country will depend.

In many quarters it is invariably the custom to overlook the fact that education is the most technical of all subjects, and requires as careful and laborious a study as any of those subjects which have preceded it in its course. That this is not generally recognised would be borne in upon anyone who would have the patience to read the proceedings and discussions of the numerous educational conferences, and I know one who has done it, which have been such a marked feature of the past winter. Education is "in the air," and has given rise to an almost endless succession of papers and speeches with little variation in the subject matter; the same things have been repeated *ad nauseam*, sometimes with very little difference in phraseology, while the number of really new ideas produced has been remarkably few. It is hoped, however, that as the authors are dealing with education for a new profession, which itself is in a state of flux, they may, in what follows, contribute something of value to the general discussion. The following is, at any rate, a genuine attempt to place aeronautics on its educational side on a sound basis, so that, on this side, it may rank with the older well-established branches of engineering.

It is assumed that it is unnecessary to discuss the question as to the necessity for well-thought-out and co-ordinated schemes for the technical education of those who are to take charge in the near future of this important and scientific industry, that is, if this country is "to take the air and keep it," as has been recently well said by a well-known authority. If anything could have emphasised the point it would have been the far-reaching plans unfolded in the interesting paper of Mr. Holt Thomas and the discussion thereon barely a month ago in this series of lectures. Those plans take it for granted that a highly-trained staff of constructors and workmen will be available possessing a flexibility of mind based upon sound and varied knowledge which can only be acquired by such training as that which is dealt with in the present paper. The backbone of such a staff is an ample supply of aeronautical engineers who usually commence their professional work as technical assistants and who by habit and training are acquainted with the latest developments of the practical, scientific, and industrial problems which they are called upon to face. The greater part of the paper is, therefore, devoted to a discussion of the methods, as they appear to the authors, of training those who are in a position to devote not less than four years to a training designed to fit them at the end of the training to commence practice as junior or senior technical assistants with every prospect of rising rapidly to higher, responsible positions. The needs of other classes less favourably placed and of those who are to fill lower positions are not lost sight of, and especially of that class of men already in the industry who *must* be given opportunities for keeping abreast of aeronautical developments as they proceed and of making up from time to time the ground which the strenuous nature and preoccupation of their daily work must cause them to lose.

The main object of the paper is the professional training of aeronautical engineers, but before this can be adequately dealt with it is necessary to consider the educational foundation upon which, in the opinion of the authors, this training should be based, for one outcome of the past winter's discussions had been to bring into prominence the chaotic nature of much of the general education of the youth of this country.

PRELIMINARY EDUCATION.

The preliminary education of students who desire to be trained as aeronautical engineers should, in the opinion of the authors, be a good secondary school education, in which the student has been taught, through the medium of the proper subjects of such an education, to think and to weigh evidence. If this end be attained, it is far more important than any workshop or other quasi-technical training that can be obtained in a secondary school, especially if, as is often the case, such training is given at the cost of the more essential subjects of a secondary school education. The claims of science and scientific method to be included in such a curriculum have now been practically conceded, even by many who have been for long years staunch upholders of the claims of the "humanities," to dominate the time-table to the exclusion of nearly everything else but mathematics. A good grounding in mathematics is, of course, of prime importance to the future engineer, and his curriculum must also include a good working knowledge of not less than one modern language, in view of the large amount of scientific and technical literature published in foreign journals and by foreign societies, as well as of the fact that during the next 50 years an enormous amount of engineering work will be required in countries in which English is not the vernacular, and that engineering industrial developments will be the common heritage for all time of all the civilised countries of the world.

For many years science was practically tabooed in the secondary schools on the plea that there was no room for it in a time-table in which even modern languages had not a very conspicuous share. What was still worse was that the best and brightest boys, or, at any rate, those developing the greatest promise, were never given a chance of showing their aptitude for a scientific training, but at an early period of their school career were set to specialised studies in the humanities, including an excessive amount of time devoted to Latin and Greek, so that in due course a small minority of them might bring renown and distinction to the school by winning University scholarships. Meanwhile, as a sop to public opinion, a "modern" side was formed, to which only the conspicuous failures were drafted.

These evil methods still persist in certain schools, but other dangers have more recently begun to show themselves in quite another direction. There is now a danger that science may not be adequately dealt with because of the desire to include "engineering" subjects in the time-table. The prospective engineer should first be well educated, in the proper sense of the word, in mathematics, in the humanities (but including English and modern languages), and in science, his education in science being with a view to training in scientific method rather than to the handling of a large number of subjects. An education which adequately covers this range will certainly fill the limited time of the average boy and will satisfy the ambition of the most voracious schoolboy. The intensive study of the sciences on which all engineering is based as well as the special "engineering" subjects which, of late years, are becoming fashionable in certain schools will be far more advantageously and economically postponed until the time when real professional training is undertaken.

If the student has received a good education, in the sense set forth, he should be ready to start his engineering training by the time he reaches the age of 17 in the case of the best students, and at 18 in the case of students whose development is not so well forward. From the engineering point of view, the retention of a youth at a secondary school beyond these ages for the purpose of taking so-called "engineering subjects" constitutes a very serious loss of time, in view of the fact that such subjects cannot be properly and economically taught, except in correlation with a systematic and well-organised complete engineering course, and further, such work cannot in general be effective when undertaken by any but a fully qualified engineering teacher. It is obvious that when subsequently attending a complete engineering course at a technical college the student will receive in fuller and sounder measure such instruction as part of the regular course covering all, and more than all, he could have possibly received in a secondary school; and moreover, there is a real danger, which has been actually experienced, that certain methods and ideas included in certain school courses may have to be corrected, if not eradicated.

TECHNICAL TRAINING.

Passing now from the preliminary but important school work to the subsequent professional training, there is much division of

opinion among engineers and engineering teachers as to the position which workshop training should occupy in relation to the more purely technical training of the student. Many engineers and engineering teachers are of opinion that practical experience on the works or in the factory of an engineer should be gained *before* taking up an engineering course at a technical college. They argue

(1) That works experience is necessary to enable the student to take full advantage and realise the importance of his studies at an engineering college.

(2) That it does not follow that a man who has first passed through the technical college will necessarily make a successful engineer, the works training under practical conditions being, it is asserted, the best test for his fitness.

(3) That the student trained in the technical college does not, after his college course, take kindly to the manual labour in the shops necessary to complete his experience, and that when he passes into the works as a workman he finds a greater difficulty in raising himself afterwards to a position of responsibility than one who has obtained works experience first and technical training afterwards.

There are, however, other well-known engineers (and engineering teachers) who are of opinion that the above views are too often based on an imperfect knowledge of what a really good technical course in a modern and up-to-date technical college can accomplish, especially if it be combined with practical experience in works judiciously introduced at the proper period when the early stages of engineering training have been sufficiently developed to prepare the student to assimilate the experience of a commercial workshop more rapidly. Such systems of engineering education are now known as "Sandwich" systems, and as long ago as 1903 a pioneer system of this type was adopted at the Northampton Polytechnic Institute, after a careful and exhaustive inquiry into the details and the results of the various systems of engineering education then in being in the chief countries turning out good engineering work. In organising, planning, and carrying out the necessary instruction courses, the Principal, who introduced the system, has received the loyal co-operation of his colleagues on the staff; and it is to this co-operation that the success attained is due, and what immediately follows is based upon the experience so gained in 14 years, and not upon mere educational theory.

It is therefore submitted that engineering training in a well-staffed and well-equipped technical college should be started directly the student leaves the secondary school, and that for this purpose, as college sessions begin at the end of September, he should leave school not at Christmas or Easter, but only at the end of the summer term in July. As already mentioned, it is considered in some quarters desirable that a student, on leaving the secondary school, should go straight into a works for, say, a year, in order that it may be ascertained whether he has any aptitude for engineering training. There is, however, a good deal of evidence to support the opinion that aptitude for engineering training can be more readily and quickly tested in a well-organised technical college, staffed with men who have been through the works—that is essential—than it can in the works. The question is, to some extent, one of "lost time." In the works weeks, if not months, must inevitably be lost before the student begins to understand in any educational sense what is going on around him. On the other hand, if he goes straight to the technical college his education is continued without a break being very apparent. In fact, one of the difficulties in a modern technical college—one meets with it continually—is to make the first-year student realise that he is no longer at school, and that his professional work has commenced, and further that the greater freedom of college conditions, which he is quick to take advantage of, is accompanied by a correspondingly greater amount of individual responsibility.

For admission to the college the student should be required to pass an entrance examination if he has not, as he should have done, passed an examination qualifying for admission to a University before leaving the secondary school. But such an entrance examination and even the University matriculation should be regarded as merely indicative, and not as the actual test of the candidate's aptitude for an engineering career. The real entrance examination in a technical college is the work of the first term, or of the first session, and during one or other of these periods the trained staff is capable of answering very definitely the question, "Should the engineering training be continued?" If the answer be in the negative the training should be dropped not later than the end of the first year, and the student should devote his energies to some other training more in accordance with his natural bent. If, however, it is decided that failure in the first year is due merely to a student, as is sometimes the case, failing to realise his responsibilities and opportunities, he should be given another opportunity of facing the first year's work.

As to the kind of training specially suitable for aeronautical engineers, the authors make no apology for basing the schemes which they put forward upon the experience of the teaching of aeronautics gained at the Northampton Polytechnic Institute, at which pioneer courses were started in September, 1909. This experience is combined with their experience in the successful training of engineers in other branches of engineering which has been referred to above. Detailed syllabuses and time-tables are set forth in Appendices I and II, and in the following remarks reference is made to these.

APPENDIX I.—SPECIAL SYLLABUSES.

I.—General Aeronautics.

(Principles and Machines.)

The Atmosphere—properties. Air at rest and in motion. Meteorology.

Definitions and first principles.

Action of air currents on plane and curved surfaces. Mass, centre of gravity, centre of pressure, lift, thrust, etc. Inertia.

Resistance to motion—wing, body, and fuselage parts. Stream line flow.

The methods used by various experimenters to determine quantitatively the air pressures on planes and bodies. Experimental data. Illustration by smoke photographs.

Angle of incidence, aspect ratio, plan form. Flight-gliding—horizontal and oblique, flight paths. Loading, speed and power. Range of power. Climbing. Equilibrium and stability—longitudinal, lateral and directional. Automatic stability. Stability devices. The tail or elevator. Dihedral angle. Steering. Propulsion, position of screws and direction of thrust. Stability and speed.

Distribution of pressure on wing elements. Movements of the C.P. on wing sections.

Laws of similitude.

Turning, elevating or depressing, banking, rolling, pitching, skidding, looping, etc.

Oscillations. Gyroscopic action. Effects of fluctuation of stresses on the structural parts. Fatigue of materials and of structural members.

Design.—The mechanical design and construction of aeroplanes. Wing surfaces and camber—forms and arrangement. Monoplanes, biplanes, and multiplanes; wing warping; the fuselage, body, stays, struts, and attachments: the undercarriage and shock absorbers. Starting and alighting devices. Boxing in and form of envelope. Skin friction. Bearings and joints. Transmission mechanisms. Controls. Instruments.

Materials of construction:—Steel, special alloys, wood, paints, varnishes, etc.

Assembling. Storage accommodation, heating, lighting, signals, etc. Cost.

Dirigibles. Seaplanes and lighter-than-air machines.

Accidents and their cause, analysis.

Applications.—Radii of action. Warfare, sport. Passenger, mail, etc. Speed and distance. Cost per ton mile. Modifications in design.

II.—Aero-Engines.

Cycles for internal combustion engines—Otto and two-stroke cycles. Advantages and disadvantages. Ideal and practical thermal efficiencies. Special considerations in designing aero-engines of reasonable weight. General theoretical and practical calculations. Weight and power of engines in relation to aeroplane speed range.

Petrol, its combustion and behaviour in the cylinder. Petrol storage in machines.

Arrangement of cylinder and crankshaft torque. Balancing. Vibration, periodic and variable, and dangerous stresses.

Water-cooling systems. Air cooling.

Lubricating systems. Lubricating oils and testing.

Types of aero-engine—horizontal, vertical, diagonal, or V. Radial, rotary and special considerations in design. The aero-engine of the future.

The design of special mechanisms and parts, such as cams, valves, port and pipe ways. Carburettors and carburation.

The fixing of the engine.

Ignition and electrical devices. Sequence or order of firing. Wiring and connections.

Accessibility of parts for rapid de-mantling and reassembling. Reliability and durability in running.

III.—Aerial Propellers.

(Their Theory and Design.)

Geometry of the screw and of propeller. Definitions. Air flow and forces on blade elements. Principles and formulæ. Blade shapes and sections. Various graphs for load, stresses, thrust, efficiency, horse-power, etc. Stresses due to centrifugal action and due to bending. The air screw at different speeds of translation. The propeller considered as an helicopter. Lifting effort. Effect of propeller on stability of machine with calculation on couples due to gyroscopic action. Design of propellers.

Materials used in construction. "Laying out" of an air screw. Results of researches on the behavious of air screws in the laboratory and under practical conditions of flight.

APPENDIX II.

TIME-TABLES.

PART I.*—AERONAUTICAL ENGINEERING.

*HOURS.	MONDAY	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.
10.0	Mathematics. Mechanics.*	Mathematics Exercises.	Mathematics Exs.	Mathematics.	Engineering Drawing and Design.
11.0	Mechanics. Exercises.	Physics (Optics)	Physics (Heat).	Physics (Electricity and Magnetism).	
12.0	Mechanics.	Engineering Design Lecture (A).	Physics Exercises.	Mathematics and Physics Exercises.	
2.0	Freehand Drawing	Physics Laboratory.	Chemistry Lecture.	Engineering Workshop.	Physics Laboratory
3.0	Mechanics Laboratory		Chemistry Laboratory.		
4.0					Gymnasium.

** Each part covers a session's work.*

PART II —AERONAUTICAL ENGINEERING

HOURS.	MONDAY	TUESDAY	WEDNESDAY.	THURSDAY.	FRIDAY.	SATURDAY.
10.0	Theory of Machines (A).	Materials (A).	Electrical Technology (A_2).	Engineering Chemistry Lecture.	Engineering Drawing.	Engineering Workshop.
11.0	Mathematics.	Electrical Technology Exercises.	Mathematics.	Engineering Chemistry Laboratory		
12.0	Heat Engines (A).	Electrical Technology (A_1).	Engineering Design Lecture (B).			
2.0	Electrical Technology Laboratory	Engineering Exercises.	Engineering Exercises	Engineering Exercises	Electrical Technology Laboratory.	
3.0		Power Laboratory	Mechanics and Materials Laboratory	Engineering Drawing.		
4.0					Gymnasium.	

PART III.—AERONAUTICAL ENGINEERING

HOURS.	MONDAY.	TUESDAY.	WEDNESDAY	THURSDAY.	FRIDAY.	SATURDAY.
10.0	Aeronautical Drawing.	Aeronautical Exercises.	Graphics.	Materials.	Engineering Exercises.	Aeronautical Laboratory.
11.0		Aeronautical Lectures (Principles).		Theory of Machines.	Hydraulics and Pneumatics.	
12.0 to 1.0	Electrical Technology	Mathematics.		Mathematics.	Engineering Exercises.	
2.0	Electrical Technology Laboratory	Aeronautical Drawing.	Aeronautical Design.	Aeronautical Lectures (Machines).	Engineering Workshop.	
3.0				Aeronautical Exercises.		
4.0 to 5.0	Gymnastics			Gymnastics.		

PART IV —AERONAUTICAL ENGINEERING.

HOURS.	MONDAY.	TUESDAY	WEDNESDAY.	THURSDAY	FRIDAY.	SATURDAY.
10.0	Aeronautical Drawing.	Machines and Structures.	Engineering Workshop	Materials.	Aeronautical Drawing and Design Laboratory.	Aeronautical Laboratory.
11.0		Mathematics.		Mathematics.		
12.0 to 1.0	Aeronautical Lectures (Engines and Propellers).	Engineering Exercises.		Engineering Quantities and Estimating.		
2.0	Aeronautical Exercises	Aeronautical Drawing and Design.	Aeronautical Drawing and Design.	Engineering Exercises.	Materials, Lectures or Laboratory.	
3.0	Engineering Exercises			Aeronautical Lectures (Machines and Design).		
4.0 to 5.0	Gymnastics			Gymnastics.		

No distinction is made in what follows between the professional training of engineers in the Universities and in technical institutes. In both cases the training is essentially the same for all students who are commencing their training and for all students up to the standard of a first, including an honours, degree at the University. As a matter of fact, throughout the country the association of the larger technical institutes with the Universities is very close indeed. In London the principal teachers of engineering, in the more important of the polytechnics which deal prominently with engineering, are members of the Boards of Studies in Engineering at the University, and these institutions are recognised under the University Statutes for training internal students. In Manchester the association is even closer, the Municipal School of Technology being a part of the University for all effective purposes Similar associations exist elsewhere, but in accordance with our time-honoured English plan of doing these things, they differ in detail in almost every instance.

The chief function of a technical college in this connection is obviously to train real engineers and not merely to train University graduates, but if the University curriculum is properly drafted, the two curricula cannot differ very much up to the honours standard of a first degree. Where the University work in the future should be most differentiated from that of the technical colleges should be in the greater leisure and opportunities for post-graduate research, though, as is well known, such research is by no means neglected at the foremost technical colleges, and the point is dealt with later.

For the purposes of this paper it will be convenient in taking up the details to separate that part of the college training which is not specially aeronautical, but is common to other branches of engineering, from the part which is more particularly required by aeronautical engineers, and which would not, as a rule, be taken by other engineering students.

THE NECESSARY COLLEGE TRAINING NOT SPECIALLY AERONAUTICAL.

It is not clearly understood by some aeronautical engineers and by many others that a sound preliminary training in general engineering principles similar to that outlined in the Northampton Institute syllabuses for first and second-year day students is required before any reasonable progress can be made with the higher studies in aeronautics, or even of any studies in aeronautics distinctively so called; and further, that concurrently with the specialised instruction in aeronautical engineering following such a preliminary training, much higher instruction work in mechanical engineering is required. For instance, it is essential that the student's mathematical studies shall continue through each year while attending the technical college, the standard of knowledge attained being the same as for other departments of engineering, and including a good working knowledge of the differential and integral calculus and of higher mathematics generally.

The course outlined is intended to cover four ordinary educational sessions from the beginning of October in the first year to July in the fourth year. In this period the second and third summers, from April to October, are to be spent in commercial workshops, with only such works holidays as fall within those months.

The first session's work is based upon the assumption that the prospective student has attained the well-known standard set for the matriculation at the University of London, either in a general examination or through the senior school examination. This ensures a fair knowledge of elementary mathematics, the power of expression in English, a knowledge of one language, and

some knowledge of a science from which it is hoped that the student has acquired some idea of scientific methods. So as not to exclude latent engineering talent, however, some students are admitted on a designedly lower entrance standard in view of the rigorous application of the plan set forth above of treating the whole of the first year's work as an extended entrance examination.

The first session's work is devoted to a thorough grounding in mathematics, pure and applied, physics and chemistry, with the addition of engineering drawing and elementary engineering design, such as is required by all engineers, civil or mechanical. It is during this period that the ineligibles and the slackers are weeded out, rather than at the entrance examination, at which some of the students on the border line for passing can, therefore, be admitted as probationers, to give them a chance of showing whether they are likely to be successful in the later courses.

Special technological training begins with the second session which, as already explained, is a two-term session, at the end of which works' experience, lasting from Easter to October, is to be started. Distinct specialisation begins from the time the student goes into the works at Easter of this second session, and from that time onward the aim is to train him very specially in some main branch of engineering, in this case in aeronautics, whilst giving him a good knowledge in other branches. It must be understood that in these later years, notwithstanding early promise, a particular student may show that he is unable to assimilate the highest training offered. In such a case it will be advantageous to transfer the student to the works when he has reached the limit of the college training which he is capable of absorbing, and which will undoubtedly be a great advantage to him in his subsequent work.

Time-tables for these two sessions of general training are given in Appendix II, but as detailed syllabuses are not given in Appendix I, a few remarks may be made upon the scope of the work in the various subjects at this stage.

In mathematics the aim throughout is to train and develop the student's mathematical faculty (which if poor or entirely lacking will disqualify him from dealing with advanced problems in engineering) in such a way that ordinary mathematical processes in algebra, geometry, trigonometry, and the differential and integral calculus become *working tools*, to be almost unconsciously used as a matter of habit.

The physics in the preliminary course is treated with the distinct purpose of qualifying the student specialising in aeronautics later on to deal readily *inter alia* with the theory and practical calculations of aero-engine cycles, to grip the principles and details of magneto ignition and other electrical devices carried by aircraft, and to understand their observational equipment, etc., etc.

The special study of aero-engines must obviously be preceded by an outline study of heat engines generally and of heat engine cycles, particularly those dealing with internal combustion engines. The fundamental principles of hydraulics and pneumatics, as well as of meteorology, call for special study during the preliminary work at a properly organised course of instruction in aeronautics.

During this preliminary course the student also acquires a knowledge of the principles of chemistry sufficient, at least, to enable him to deal effectively, when taking the higher and more specialised work of the advanced course, with the necessary calculations on the combustion of fuel, and particularly of gaseous fuels. His laboratory training includes the use of gas analysis apparatus and the analyses of exhaust gases from internal combustion engines.

His preliminary studies of engineering materials, from the chemical as well as the mechanical point of view, are designed to enable him to understand the importance of a chemical analysis of the material and of the influence, beneficial or deleterious, of small percentages of certain chemical elements on the properties of the material for resisting static or kinetic stress and on the elasticity and resilience of the material.

Aeronautical drawing and design obviously cannot be properly dealt with until the student has first mastered the elements of geometrical and mechanical drawing and made himself familiar with drawing office methods. This preliminary training, therefore, is dealt with before attempting any specialisation in aeronautics. In the courses and time-tables given in Appendix II provision is made during the first session for giving a thorough grounding in these essentials, and it is unnecessary in a paper of this kind to give a syllabus of the kind of preliminary work in this connection. It is too well known to require specification.

And last, but not by any menas of least importance, some attention must be given to the business or commercial side of engineering. How often has it been said by the employer, "Yes, So-and-so is excellently trained in engineering theory and is even fairly good as a designer, but in business matters he is a baby, and not to be compared with men in my works who, though they may not be good at theory, know and can deal with the bearing of their work in relation to £ s. d. It is a pity that the technical schools cannot give some attention to their work in its business aspect." Even in the preliminary work, therefore, this aspect must not be overlooked, though its formal treatment belongs more properly to the specialised work of the third and fourth sessions.

The College Training specially Aeronautical.

This special training, as already explained, is dealt with in the third and fourth sessions' work for which the time-tables will be found in Appendix II. For the special subjects appearing in these time-tables detailed syllabuses will be found in Appendix I, but in view of the relevancy of these subjects a few general remarks will not be inappropriate here.

The theory of machines and of mechanism, to lead up to which a good knowledge of mechanics is provided in the first two years, form a special feature of the advanced work in direct relationship to many practical problems, such, for example, as the inertia effects of moving masses, whether free or constrained, as in the primary and secondary balancing of engine parts. In this connection the gyroscopic effects on the machine, due to rotation or turning, in the engines, mechanism or propeller, and also the machine itself, are fully dealt with.

The advanced design work for aircraft prime movers necessarily involves the advanced theory of heat engines, modified by practical considerations and experience, together with mechanical design based on a full knowledge of the strength, elasticity, fatigue and durability of materials.

More advanced work than can well be included in preliminary courses is, therefore, given on the strength, elasticity and fatigue of materials, and proceeds concurrently with specialised instruction work in other subjects of aeronautical engineering. The effects of fatigue on the various parts of an aeroplane structure due to repetitions and variations of stresses does not yet appear to have attracted serious attention in connection with aeroplane work, and, no doubt, some disastrous failures of machines are due to such effects.

The advanced drawing office work in aeronautics consists in applying the general principles and experimental data for aircraft to the design of the details, the chief parts of the machine, and finally the full structure, with provision for more advanced design for students who wish to specialise in some particular section of the work, e.g., engines, or propellers, or fuselage.

Very little has as yet been properly standardised for the constructive details, or even for the full machine, and each manufacturing firm is to some extent a law unto itself. This is, of course, inevitable from the nature of the case. Only a very limited amount of standardisation would at the present time be of any value, for the design work for aeroplanes is in such a state of flux that parts have to be designed and re-designed over and over again before anything final for a particular machine can be arrived at. After each design it becomes necessary in many cases to subject the built-up product to experiment or test in the laboratory and workshop, with the result that more often than not re-design is necessary. For example, unexpected weaknesses may be revealed under test in some part of a joint or clip, so serious as to render the greater part of the design useless until the defect is remedied by a modification of the whole design.

This being the present state of things in relation to aeronautical design it follows that at the technical college testing in many cases should follow preliminary designs so as to arrive at a design distinctly good for the purpose it is intended to serve.

Too much must not be expected from the trained product of a technical college in this respect. As remarked more than once the profession of aeronautics is a new one, and at present subject to ever varying change. A vast amount of experimental work has yet to be done, new ideas which are at present only dimly emerging have yet to be tried, and new materials and combinations of materials have yet to be put to the test of actual utilisation. The manufacturer must be satisfied if the technical college gives him a trained intelligence under the guidance of a sound common sense; in short, a man who is well versed in the fundamental principles of aeronautics, and who can apply his knowledge to a reasonable extent in both experiment and design.

Laboratory work, especially of such a highly technical type as is necessary in the education of aeronautical engineers, does not lend itself in the same way as lecture work to the precise synoptical specification of a formal syllabus, and, therefore, no laboratory syllabus is set out in Appendix I. The scope and range of the work recommended will be better gathered from the following remarks.

In attempting, however, to give even an outline of some of the essential experimental or laboratory work one is brought face to face with the kind of difficulty necessarily experienced in dealing with a new industry or applied science, and in endeavouring to organise the educational work relating thereto so as to give both the systematic instruction in the fundamental principles underlying that industry and to stimulate ideas for future developments.

Seldom in any branch of engineering has a new profession been created in so short a time and never under such dramatic circumstances. Aeronautical engineering as a profession has been brought into prominence and practically created by the great issues at stake in the disastrous conflict still raging. Before the war aeronautics was little more than a sport or pastime; it has now

definitely taken its place and will in future rank as a great profession.

The laboratory work specially aeronautical in character should consist of the testing of :—

(a) Special materials used in aeronautical construction for strength, elasticity, hardness, and fatigue.

(b) Fastenings, attachments, shock absorbers, and combinations of parts.

(c) Models of different forms in a current of air at different velocities.

(d) Propeller models in translational as well as for rotary motion.

(e) Aero engines.

Much of the laboratory instruction undertaken at the technical college will thus necessarily be of the nature of research, although a good grounding will have to be given in the more usual work dealing with the testing of the strength and properties of material and with the testing of engines generally.

In the testing of materials now commonly used in aeroplane construction, new materials will from time to time have to be tried. In addition to the testing of cables, strainers, and struts and ties, experiments will have to be made on simple and complicated steel and other plate and bolt attachments for building up the light skeleton aeroplane fuselage of wood and metal. The materials testing laboratory for aeronautical engineering students will thus become, at any rate for some years, primarily a research laboratory.

Taking timber, for example, as used in aeroplane building, it might be thought that sufficient experimental data had been accumulated regarding spruce and other woods. But this is not the case, though probably there is much more data available than has been published. Much of the requisition experimental work remains yet to be done in the determination, *inter alia*, of the effect, on the strength and elasticity of the material, of defects inherent in the natural growth of the timber.

It has been shown, for instance, that the useful strength of timber is due to that part of its morphological structure known as "mechanical tissue," and experiments have been made which seem to point to the conclusion that this tissue is actually stronger than steel, but of course it is diffused or spread out by other vegetable or cell structures of negligible strength. Here alone is a vast field for research. Can this mechanical tissue be concentrated into close bundles giving relatively enormous strength, and, if so, will the density of the material be then so high as to prohibit its use? Obviously the density, or mass per unit volume, is a factor which cannot be neglected in aeroplane work. Some woods are too heavy to be used at present. One of the author's assistants in a research carried out in the Materials Laboratory at the Northampton Polytechnic Institute, showed, for example, that the compressive strength of different kinds of timber was a linear function of the density—a very important result. Other properties, such as tenacity, deflection, and, in the case of struts, buckling, may also be a function of or dependent on the density. Then investigations are required on the strength and elasticity of timber, for the effects of knots and gum veins, the straightness or otherwise of the grain, the closeness of the mechanical tissues, the direction of the grain with respect to the plane of flexure. The effects of water absorbed during variable conditions of climate, e.g., snow, rain, or clouds, and the hygrometric state of the air on the material of the timber, have yet to be investigated.

There is further the necessity of testing plate and other attachments, by means of which the timber parts are secured together to form the skeleton structure of the fuselage, and in this connection those who have had to deal with the design and testing of these plate attachments for wood members know how very difficult it is to secure so firm a holding on such a light wood as spruce as to stand a reasonable working stress. Here again is a valuable field for laboratory work.

Turning to another matter, a very prominent part of the laboratory equipment must consist of a wind tunnel, with its motor-driven propeller and provided with indicating and recording instruments for experiments and research on models of planes and wing surfaces or structures, on models or parts of aeroplane structures, etc. Part of the wind tunnel should be arranged so that the air or streamline flowing past a plane model or solid obstacle can be made visible and the resistance measured. That is, the experimental work should be qualitative as well as quantitative in the determination of lift and drift for surfaces of varying forms and aspect ratios and the resistance of models of aeroplane parts which are required to cut through the air. Indications of best sections and forms can in this way be obtained and provisional designs satisfactorily adjusted.

Workshop and Practical Work.—In the general scheme the bulk of the workshop and practical work is to be taken in actual and not in the college workshops during the two summer periods, referred to hereinbefore, and if in particular cases additional work of this kind is deemed to be necessary it would naturally fall to be taken at the end of the fourth session.

In aeronautical engineering there is one kind of practical work, namely, aviation or flying, which cannot under present conditions be included in the course at a technical college, but in regard to which the student should acquire some definite knowledge. While, therefore, the educational course cannot deal with flying *qua* flying, yet it will be of advantage to arrange for periodical visits of the students to the flying grounds, and even to provide for some lectures given by an engineer-aviator on the behaviour of aeroplanes under practical conditions of flight. In addition, as in other branches of engineering education, visits should be paid to works in which aeroplanes are in various stages of construction. In this way the student will be stimulated in his studies and will gain some insight into the everyday work of the aeronautical engineer.

It may even be found to be possible in the case of the senior students to arrange for trial flights so as to familiarise them still further with the behaviour of the machines upon the theory and designing of which so much of their time will have been spent.

The case is analogous to that of the student apprentices of locomotive engineering or of marine engineering, who are always ambitious to take part in a trial run or a trial trip. Similarly, it is natural to suppose that a trial flight (not as pilot) will have attractions as well as being practically valuable for the student apprentice who is approaching the end of his college training in aeronautics.

Perhaps even the day is not far distant when the requirements of education and research will justify an experimental aerodrome, laboratory and flying ground for experiments on a larger scale and of much wider applications than is possible at the present time. The chief obstacle at the present time is the necessarily heavy expenditure, but to go forward we must not be afraid of this.

Special and Evening Instruction.

No scheme for the education of aeronautical engineers can be considered complete at the present time which fails to take into account the general as well as the specialised instruction required by the very large number of engineers and engineering students who, for various reasons, are quite unable to attend aeonautical courses in an engineering day college.

These men may for the most part be placed in one or other of the following classes or categories :—

(1.) The rank and file of apprentices, learners, improvers and journeymen, the best of whom may subsequently rise to class 2 and who are employed or employable in the shops and drawing offices.

(2.) Trained engineers, military, civil, mechanical, or electrical, who have already received in varying degrees of proficiency the educational training qualifying them for the particular branch of engineering in which they are or have been employed and who, from the force of circumstances, have changed over or intend changing over to aeronautical engineering. From the necessities of the case it goes without saying that, up to the present, the best design and constructive work in aeronautics has been done by men who received their technical education in one or other of the older branches of engineering before aeronautical work developed and this training has proved invaluable to them as a solid foundation for the specialised work of aeronautics. For some time to come the ranks of the aeronautical engineer will still be recruited from men already possessing these solid qualifications, the more ambitious of whom will be eager to supplement their training and experience by special study of the new science.

For the first-named or apprentice category an excellent start, well calculated to arouse the interest and stimulate the ambition of many who are not only too much inclined to waste their leisure time, has been made in the series of works lectures which have been inaugurated by the Society during the present session and which it is proposed to extend in the coming autumn and winter. Further reference is made to this work later.

It is not likely, however, to be overlooked that, if substantial educational benefit is to follow from these lectures, regular and systematic courses must be attended in a well-organised technical college. Such students will have to face much preliminary work in mathematics and general engineering theory, in drawing-office and laboratory work, before any real progress can be made by attendance at classes dealing specially with aeronautical engineering. Indeed, it will be found in this connection, as with other branches of engineering, that a very large number, probably the majority, will never effectively get beyond the mere elements of workshop calculations and drawing. Many are called, but few chosen. Aeronautical engineering, like other professions, requires its "hewers of wood and drawers of water." But we want to give all the men a chance.

Notwithstanding, it is advisable to arrange lecture courses and practical work of an elementary character in aeronautics specially

suitable to the requirements of the man who will join the artisan section of this important industry. He will be a far better workman because of a knowledge of workshop arithmetic and drawing, supplemented by simple laboratory experiments and by information gained whilst attending aeronautical lectures sufficient to arouse and maintain a living interest in his daily work. Some there will be who will rise through and overcome every difficulty and disability, and to these such a preliminary course of work will not only present no insurmountable obstacle, but by the facilities available will help them on their road to higher things. Such men will finally show that they are capable of successfully grappling with the higher studies requiring the more complete knowledge. A few will go beyond and raise themselves from the workman grade to that of the professional man.

The courses arranged will be progressive, the more elementary being suitable for the machine and bench hand and the higher for the leading hands, shop foremen and others.

An important question is the period of the day when such courses should be given. Up to a comparatively recent date it was assumed, almost without question, that the only time available was the evening after a full day's work had been done in the commercial workshop. For those who have attained to the position of leading hand or shop foreman it is probable that this is still the only available time. But for the juniors who have only recently left school and who are yet in their teens it is now widely recognised that such evening work involves a strain to which the majority of youths whose physical development is still immature should not be subjected, and the existence of which goes far to neutralise the educational benefit which should result. For these students "time off" during working hours is absolutely necessary, and it is indeed probable that, in the near future, legislation may require that such time off shall be given. The Minister of Education has already spoken of this.

Such proposals raise social and other questions which it would be outside the limits of this paper to discuss, but, from the educational standpoint only, the definite opinion may be expressed that compulsory attendance of the juniors in engineering works at afternoon classes should lead to valuable educational results.

At this stage it is relevant to speak more fully of the splendid work done by the Aeronautical Society in its students' section in the series of ten lectures delivered during the past six months at the Hendon centre and afterwards repeated at Cardiff. No excuse is needed for mentioning so recent a departure, for it is very probable that there are many, even members of the Society, who have not realised the educational significance of this work.

The lectures at Hendon were delivered in a conveniently placed public hall to the employees in the numerous and important works and aerodromes congregated in the neighbourhood. No charge was made for admission. In each case the lectures were given by well-known experts in the particular subjects dealt with, and usually a well-known member of the Society presided, our worthy President being in the chair at the first meeting.

Such a series of lectures repeated throughout the country in the various industrial centres devoted to aeronautics may well be regarded as having two principal objectives, though their influence will, it is certain, be much wider. The first of these objectives is the building up of a strong students' section for the Society itself. These students' sections, in more than one of the professional societies, have been a distinct success. They are essentially democratic, being organised and conducted under the ægis of the Society by the students themselves. Ordinary members of the Society are not allowed to attend the meetings with the one exception that at each meeting the chair may be, and usually is, at the invitation of the students, taken by a prominent member of the Society. The idea is that the meeting-room should not be filled with expert critics before whom the students would be unwilling to air their original, if somewhat crude, notions. As a rule a student who has had special connection with a definite part of the subject is put up to read a paper. Other students diligently get up as much as they can of the subject in the time available and mercilessly criticise their colleague. The chairman acts as a moderator, and, whilst not sparing in his criticism, it is hoped, and, as a matter of fact, as a rule, it usually so happens that he criticises with the necessary courtesy and consideration.

The other object which the lectures at Hendon and similar lectures may be regarded as serving is the popularising and stimulation of further study amongst those actually engaged in the lower ranks of the industry. Incidentally, such lectures must lead to the desire on the part of the more ambitious, who, we may hope, in this industry will be the majority, to systematise their knowledge by attendance at well-organised technical courses. Should this object be attained, nothing but good can result to the industry as a whole.

One need not dwell at length upon other and obvious advantages in such courses of lectures, not the least of which is the personal intermingling of so many young men with similar aims, who will be the standard-bearers as well as the chiefs and captains of industry in the not very distant future. An intimate knowledge of those who are to be either directly associated with oneself or to be one's competitors is not the least effective factor in a successful career in any large industry such as that we are considering.

Turning now to the second category for whom special educational facilities should be provided, aeronautical lectures, laboratory and drawing office classes dealing with the subject-matter outlined in the syllabuses will be the first essential and will meet the requirements in many cases.

For many such students, however, still more specialised instruction in aeronautical engineering is desirable, and indeed necessary. For this purpose occasional or visiting lecturers or instructors with special qualifications should be appointed both for day and evening work. Specialists must be brought in. These lecturers should be intimately connected with the design and construction of aeroplanes as part of their regular daily work, and should be men who have themselves received a sound and thorough technical training in the advanced as well as the more elementary fundamental principles of engineering theory. In other words, they should be highly trained on the theoretical side as well as on the practical side. Moreover, an endeavour should be made to select men with a special knowledge and skill in particular branches of aeronautics, and special lecture or instruction courses should be arranged accordingly. The following are some of the subjects in which such instructors may be required for lecture and design classes :—

(1) General aeronautical engineering.
(2) Fuselage design.
(3) Aero-engines.
(4) Aero-propellers.
(5) Magneto-electric ignition and other auxiliary electrical devices.
(6) Meteorology and the meteorological conditions during flight.
(7) The behaviour of aeroplanes in the air and aircraft performance treated by an expert engineer-aviator.
(8) Dirigibles and lighter-than-air machines.

This list is not exhaustive, but typical.

The above are suggestions for consideration based on some experience, with successful results, in providing special lectures with expert instructors in specific subjects. It will be well understood, however, that the highly special work, some of which is outlined, cannot be fully taken advantage of by individual students until the elementary and the higher general engineering and aeronautical work have been fully assimilated. It has become too much the fashion in some quarters to advertise and give special lectures in aeronautics without realising that such lectures are not likely to be of practical value until they are developed into special treatment on the drawing board, in the laboratory, and in the shops.

For the best results the specialised lecturer in some of the above subjects should also conduct the design or drawing office class for his special section of the work, or failing this, the class should be taken by another properly qualified designer with intimate knowledge of his subject.

Research Assistants and Scholarships.

There remain two other sections of the subject to which it is important that some reference should be made, namely: (i) research and (ii) scholarships, and these may well be taken together. It has already been pointed out that much of the laboratory work in aeronautics at the technical colleges will necessarily be of the nature of research work, and in order that this work may be efficiently carried out it is essential that the ordinary teaching staffs should be strengthened by the appointment of

(a) Research assistants.
(b) The establishment of senior scholarships and research studentships.
(c) The establishment of junior scholarships.

on the lines set forth in a Report issued last year by the Committee of the Privy Council for Scientific and Industrial Research, now the Department of Scientific and Industrial Research.

These additional assistants should act under the direction of the professor or head of department, who would suggest lines of research in addition to those suggested by the assistants themselves. Suggestions for researches from other quarters such as the Aeronautical Society should also receive every consideration, and, where funds are available or can be provided, a serious effort should be made to enlist the direct interest and support of the local education authorities.

In view of the fact that the research assistant would be appointed to work at a particular college, it is recommended that, as the success of the work would depend very much upon the qualifications and personality of the assistant, his selection should be made by the technical college concerned, and on no account by competitive examinations. The donors of any funds for providing the research assistant would, of course, be consulted.

A suitable research assistant having been appointed, he should give his whole time to the work, but in the general interest of

aeronautics it should be possible for his services to be utilised for teaching work in aeronautics for a certain number of hours during the teaching session. This arrangement would be advantageous in giving the assistant a very vital grip of the general aspects of his subject, and would be specially useful to him as well as to the teaching profession if he intended later to become a teacher of aeronautical engineering.

It is, of course, assumed that the assistant appointed would be well qualified for research work, and that he would not necessarily require any considerable proportion of the time of the head of the department, otherwise he would be of doubtful value.

With respect to (b), it is as well to emphasise the difference between research which might be done by technical students, and research which should be done by a research assistant, the former being of the nature of training in methods of research rather than the actual undertaking of new work, which would be the proper function of the research assistant. It is, therefore, desirable that, in view of the importance of their other work, senior students during the last years of an ordinary engineering course, not necessarily aeronautics, should be trained more in methods of research rather than in actual researches for publication occupying a disproportionate volume of their time.

It is also recommended that selected students who have completed an ordinary or other approved course of training should be appointed "research students" with a small maintenance allowance, less than that allotted to research assistants, the necessary funds to be provided from the same source as the funds for research assistants. In course of time this procedure may prove of material assistance in the selection of research assistants.

There will be no difficulty in a fair number of subjects for research being suggested in any large engineering department, and researches may also be suggested by manufacturers. With regard, however, to the latter source of inspiration, it is recognised that engineering manufacturers in both small and large ways of business must have a number of problems from time to time requiring scientific investigation, but whether these manufacturers would be willing to submit to the publicity consequent upon the acceptance of public money for the purpose of the carrying out of an investigation appears to be very doubtful. In other words, manufacturers may be expected to be willing to suggest and assist in a research provided they can reap the sole benefits of the results, but may not be so willing if it be a condition that the results are to be publicly published and placed at the disposal of their trade rivals.

With respect to (c), junior scholarships should be awarded to selected evening students who have, with marked success, attended evening classes or courses for, say, two or three sessions. These scholarships, with a small maintenance allowance, will permit their holders to attend a course in the day time.

The above does not by any means exhaust the subject of the training of aeronautical engineers, but the authors trust that they have dealt sufficiently with the main lines to stimulate discussion and to bring this important aspect of the subject in precise form prominently before their engineering colleagues.

They hope that the next and subsequent sessions of the Universities and the technical colleges will witness a great development all over the country in the direction of providing sound instruction courses in aeronautical engineering.

If this hope be realised, the time spent by the authors in the preparation of this paper will not have been spent in vain.

THE DISCUSSION.

MR. BERRIMAN, in calling upon MR. HENRY FOWLER, Superintendent of the Royal Aircraft Factory, to open the discussion, expressed his sympathy with all those who had missed the lecture, and hoped that the small audience would make a good discussion.

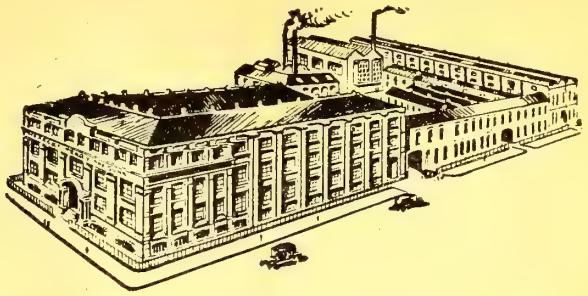
MR. FOWLER said he was very interested in the lecture from a practical standpoint. He had himself taught for several years in evening classes It was a matter of grave concern to him that the fellows who ought now to be receiving technical education were doing their obvious duty in other directions. He could see no young men coming along who could be given proper training in engineering.

He thanked Dr. Walmsley for the broad way in which he had handled his subject. He felt that so frequently in technical institutions the teacher loses sight of the man in the student, and it is the difference between the student and the man which makes this educational question so difficult.

He felt inclined to join issue with the authors as to how youths should start their technical education. The system at Derby was to have a man 12 months in the shops before sending him to a technical college. The meaning of individual responsibility was not sufficiently impressed upon students in college, but they appreciated this point in a works. He preferred a period in the shops, then college, and then a finishing in the shops.

He appreciated very highly the Aeronautical Society's lectures to aircraft workers, and was sorry that it had not been possible to hold the suggested course this summer at the Royal Aircraft Factory, but he hoped this would be done in the forthcoming session.

He thought that we must look to the teacher as well as the student. In various places the teacher is not always the right man in the right place. It was very largely a question of money



and patience. He thought that those who were teaching the masses were doing one of the noblest works for the nation.

The CHAIRMAN, in calling upon DR. BAIRSTOW, F.S.R., to speak, said that this was the first opportunity of congratulating him upon his election to the Royal Society.

DR. BAIRSTOW said he quite agreed with what the lecturer had said. He thought that by the time a student had made his position good it was too late to test his ability by a process of examination. He thought that the practice of watching a student's first year's course is the only way in which his ability to carry on independent research may be gauged.

He referred to the reactionary effect of aeronautical training upon the training for other forms of engineering. He thought that in future most examples of rigid dynamics would be taken from aeronautics. Aviation is almost a godsend to students of rigid dynamics. The aeroplane clearly demonstrated the several motions of translation and of rotation. It also demonstrated the action of couples.

LIEUT. LOW, R.N.V.R., in one of his usual gracefully turned speeches, agreed that the subject was a gigantic one. It covered about half human nature. There were students of two classes, those who were capable of abstract reasoning, and those who were not. He thought that there were only about half a dozen scientists who could determine practical results by abstract reasoning. The spiral nose-dive had been predicted by Professor Bryan before it was experienced by pilots. He therefore came within the category, and Mr. Bairstow's election to the Royal Society demonstrated that he also possessed this gift.

Colonel VILAMIL protested against the usual method of teaching mechanics. He gave illustrations of the manner in which elementary students are confused and befogged with what appears to be an almost perverse ingenuity. It was obvious that this distinguished mathematician had the entire sympathy of both audience and lecturers, although his exposition of the parallelogram of forces more resembled an inebriated spider than a mathematical proposition.

LIEUT. A. P. THURSTON, D.Sc., paid a tribute to the work of Dr. Walmsley, and laid particular stress on the very great services which he had given to aeronautical education. He was particularly interested in the syllabus laid down in the paper, which displayed many points of similarity with that of the East London College.

DR. THURSTON continued by urging the difficulties that lay before those who undertook research in aeronautical science, and claimed that these could only be overcome by attacking them with due modesty and appreciation of their abstract nature.

CAPT. KENNEDY said that we stood to-day in aeronautics in a somewhat similar position to that which was experienced some thirty years ago in electricity. It was not until the electrical industry organised itself that progress was made. He was emphatic that in aeronautics the problem of education must be tackled by some responsible and competent person.

MR. C. BORLASE-MATTHEWS urged the importance of imagination in experimental and research work.

MR. LARARD, in replying to the discussion, said he had little to add to what he had contributed to the paper. Colonel Vilamil would be glad to know that he quite agreed with his views on teaching mechanics. As regards Dr. Thurston's comments as to the similarity in the syllabuses of the Northampton Institute and those of the East London College, that was a case of two minds thinking alike.

He laid emphasis upon the importance of education in relation to the commercial aspects of aviation.

MR. BERRIMAN paid a deserved tribute to the excellence of the paper and the discussion.

DR. WALMSLEY, in reply, again drew attention to the serious question which must arise in the future in the direction of the industry. Three and four year students in engineering colleges were absolutely non-existent, and the direction of the engineering industry in the future gave him grave anxiety.

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THE AIR RAID AGITATION.

If the German Flying Corps will only keep up its aeroplane raids on London a little longer, it will do this country a real service. After every raid public feeling grows stronger and stronger, not, curiously enough, in wild fury against the Germans, but in strong, deep anger against the official people who have paltered and messed with our Flying Services, and so have failed to put up an adequate offensive-defensive.

Casual conversation with all and sundry while the heat of Saturday's insult was still upon them proved quite clearly that the demand of the people of London is for the invasion of Germany by air. Undoubtedly the line of action, which is now commonly known among the public as "the Pemberton-Billing Policy," is the only one which will appease popular anger against official dilatoriness in the past—and at present.

As I pointed out a fortnight ago, the Air Board has the finest opportunity of doing a great national service that has been vouchsafed by Fate to any body of men in the past century. But unless very drastic action is taken immediately, that opportunity will be lost. The Air Board has evidently the best intentions in the world, but its operations are hampered by conservative and reactionary officials and officers, and by incompetence and intrigue among minor officials, whose actions are obviously unknown to men in the position of Lord Cowdray and Sir William Weir. Until these malign influences are removed, and until production and technical matters generally are handled by departments which are efficient from top to bottom, we cannot reach our maximum output, and so cannot carry out effectively that invasion of Germany which alone can satisfy public demands.

There is little enough fault to be found with most heads of departments themselves; it is in the middle and lower grades that the delays and intrigues occur. The choice of efficient subordinates is a special gift possessed by few men, and the head of a department to be an outstanding success needs to have highly developed critical and judicial faculties rather than to be himself a skilled technician or an originator. Receptivity rather than constructiveness is the desideratum in a departmental chief. In lack of ability or willingness to receive and judge new ideas and in lack of ability to criticise and judge the work of subordinate officials lies the weakness of the Flying Services.

The progress made under the Air Board, as at present constituted, is remarkable when compared with anything which was ever done before, but there is still much more to be done before we reach our maximum output of aeroplanes and engines, and so achieve the best possible results in the invasion of Germany. Both mental and material sources of supply remain untouched. Ideas and designs offered freely by people who happen to be antipathetic to individual officials are turned down, regardless of their intrinsic worth. No use is made of people who might be useful, because they happen to be unpopular personally.

When conservatism breaks away from its prejudices and makes up its mind to use everyone and everything that can help to defeat Germany, then, and then only, will it be possible to say to the British people that the best has been done for them. And then only will the present angry state of the public mind be unjustifiable.

Popular Misapprehensions.

The endeavours to attack the last batch of raiders by the R.N.A.S. and R.F.C. were eminently commendable. Home Defences and Dunkirk alike deserve congratulation on their good work. Everything is moving in the right direction, but until Germany itself is attacked, public agitation will continue

There is so much lack of comprehension as to the work done by the Services that a few words of explanation seem desirable. In the first place, thousands of people in London would swear cheerfully that they themselves counted anything between 35 and 50 German aeroplanes over London. It is true that there were somewhere between 30 and 50 aeroplanes over London, and none knows it better than the Germans who were there. But—and this is what Londoners and other critics of the Services do not understand—something like half of those machines were British.

Now consider this point. The German plan of attack depends on an East wind—the stronger the better. The big Gotha machines, for all the sneers cast at them by supercilious official technicians who have produced nothing themselves, have a high speed and magnificent climbing power. Assisted by a strong East wind, the elapsed time between the arrival of the first warning from the East Coast at Home Forces Headquarters and the arrival of the attacking squadron over London is thus the shortest possible.

By this means as little opportunity as may be is given to the Home Command of sending its warnings to the aerodromes, and consequently the defensive aeroplanes have but little time to go aloft and reach the altitude of the attacking force, which is then flying low, being laden with bombs and with petrol for the journey homeward. When the bombs are shed and much of the petrol is consumed, the German machines, thus lightened, are able to climb to heights which only the best of our machines can reach, and where they are difficult for anti-aircraft gunners to see and hit, despite the slowness of their speed over the ground against the wind.

Now, the fact that the German squadron arrived over London with almost an equal number of our machines in attendance proves firstly that the work of the observation posts was done with the most commendable

smartness and efficiency, and secondly that the R.F.C. men turned our their machines with the utmost promptitude. The further fact that the machines were so packed together as to lead people to believe that they were all one force is *prima facie* evidence of the gallantry of our pilots, who, in spite of being mostly mounted on small single-seaters, did not hesitate to attack a much more heavily armed force.

The comparative immunity of the Germans from harm is explained by the simple fact that, flying as they were in beautifully correct squadron formation, they formed a solid compact mass, bristling with machine-guns in every direction, so that any attack by lightly armed single-seaters stood about as much chance of success as the attack of the bravest Dervishes on a British square in the Soudan. The really astonishing thing is not that the German force got away, but that our own casualties were so light.

A Useful Lesson.

The truth is that we were fairly beaten, not in the gallantry of our pilots, nor in the efficiency of our intercommunication service, but simply in that quality of foresight so highly extolled by Colonel O'Gorman in the recent Wilbur Wright Lecture, and in the organisation which should have attended that foresight if it had existed.

We have known ever since the war began, and before, that such raids were coming some day. In fact, we ourselves showed at Düsseldorf and Cologne and Friederichshafen how such raids could be made. And instead of developing that line of attack we left it to the enemy.

When we did appear to be threatened with intelligence for a time, as when certain raids were made from Eastern and Northern France, the excellent work of the junior officers and men on the spot was spoilt by the most lamentable mismanagement by inefficient seniors, and by people on this side of the Channel. The enemy learned from our mistakes, and has shown us how the business can be done with proper organisation.

The Triumph of the Big Aeroplane.

Perhaps the most useful lesson to be learned is that, besides being the only type of machine worth considering as a bomb-dropper, the big, heavily armed, multiple-engined machines are practically impregnable to attack by small machines, so long as they keep their formation. Some of the best brains in the Services have held this opinion for a considerable time, but they have been outvoted by the much larger number of "experts" who have never seen a big machine, who have never flown on active service, and who have not the intelligence to envisage the vast possibilities of the type. And in this the "experts" have had the backing of the sporting pilots, whose one idea is a big engine with the smallest possible fringe of aeroplane round it. The small aeroplane has its uses—none appreciates it more highly than I do—but it also has its limitations, and among them is its uselessness against a strong formation of heavily armed big machines.

So far as big aeroplanes are concerned, we are far in front of the Germans in everything except quantity production, and we may easily lead them in this also if the subject is tackled with real energy and intelligence. This is a matter for the Air Board, and it remains to be seen whether Lord Cowdray and Sir William Weir will take the problem firmly in their own hands and deal it in the light of their own engineering experience, or whether they will allow the half-baked scientists who pose as technical and engineering experts to palter with the business till the whole thing is out of date, as has been the almost invariable rule with every new idea hitherto.

The Political Aspect.

All the papers have been so full of what has been said and done and thought and suggested by politicians that it is not worth while to deal at length in this paper with the political aspect of the question. One may, however, be pardoned for lamenting that the "dud" shell imported by Sir Henry Dalziel into the House itself retained its latent energy under examination. Not that one wishes any harm to Sir Henry, but there must have been quite a number of other M.Ps. within its range whose removal would have been a national service. Probably it was just as well to burke public discussion by holding a Secret Session on Monday night. All that need be said to the public can be said by members of Parliament to their own constituents when they have the courage to go down and explain to them why, after all these years of warning, the House of Commons permitted the Government to retain in power the particular individuals who have made such a failure of certain of the work of the Flying Services.

One could easily name half a dozen people whose removal from the Flying Services would increase the value of those Services by a very high percentage. Their removal would be followed automatically by the dismissal of half a hundred inefficient subordinates, who are only retained in their positions by favour of the half-dozen. And then the really good men would have a fair chance of putting things right, without hindrance from the inefficients. At present the chief trouble is that the many excellent men under the Air Board spend so much time putting right the idiotic mistakes of others, or in trying to prevent them, that their own constructive work is seriously hampered.

If only the Parliamentary Air Committee would grasp this simple fact and insist on internal reforms, then we should be able to carry on air war with immediate prospect of real success.—C. G. G.

The Secret Session.

The following is the official report of the proceedings at the secret session of the House of Commons on Monday night:—

The **Prime Minister** said that it was better first of all to give briefly a summary of what actually happened. Twenty-two German machines of the Gotha bombing type, carrying about 800 lb. of explosives apiece, came over London. Of these, three were destroyed, one by the machines actually protecting London. Besides this, out of the protecting squadrons which the Germans had organised in order to assist the return of the raiding squadron, six machines were destroyed and one injured. The attack, in fact, had not been made with impunity. He wished to point out that the first fact which the House should get into its mind was that complete protection in the air could never be secured.

At the front our machines were every day crossing over the German lines, and, in spite of the most terrible anti-aircraft fire and very powerful German air squadrons, they were yet able regularly to bomb stations and headquarters behind the German lines. If that could be done in a region where the German aeroplanes and anti-aircraft strength were most closely concentrated and could be done daily, then the House would realise that no measures that we could take would give complete immunity. The nearest approach to immunity lay in making their visits so costly that they would not become worth the Germans' while. He wished to point out also that during the last four or five months our naval bombing aeroplanes had dropped over 70 tons of explosives on the German aerodromes in Northern Belgium and had dropped six tons on those very aerodromes on the night before the raid, whereas the total amount dropped by the Germans here was only some two tons.

The first consideration before the Government was to see that the Army in France was sufficiently supplied with aeroplanes. A sufficiency of aeroplanes meant everything to that Army. They were the eyes of the Army, which could not advance without them. By their means the Army discovered the enemy's trenches, guns,

and machine-gun emplacements. To photograph these required air supremacy, and without that air supremacy it was sheer murder to allow troops to advance. The 28 fatal casualties which had been suffered by the civilian population in the last raid were very regrettable, but unless our troops at the front were supplied with aeroplanes in sufficient number to secure a proper knowledge of the German trenches and positions and to guide the artillery barrage their losses might easily be not 28 but 28,000.

The slightest deficiency in the aeroplane work, a single machine-gun emplacement overlooked, might in a few minutes mean the loss of thousands of gallant lives. The first duty of the country was to protect these men. The Germans realised the importance of this question quite as much as we do.

The second means by which they were attempting to diminish our superiority was by trying to force us to withdraw our machines from France in order to protect our own towns. If the Germans knew that by bombing English towns they could force us to withdraw fighting squadrons from France, there could be nothing which would encourage them more. Nothing could be more disastrous to the conduct of military operations than anything which encouraged the Germans to believe that by these raids they could excite such a clamour in this country that the Government could not resist the demand for the withdrawal of aeroplanes from the front. If the aeroplanes could be provided both for the front and for our defence against raids that would, of course, be done. If not, the Army must come first, and it was vitally important that the Germans should know it. He feared that some of the articles which had appeared in the Press might prevent the Germans knowing it. He had seen something of the people in the district which had suffered from the raid a few hours afterwards. He had never seen people face disaster with greater cheerfulness and constancy. He saw no signs of panic anywhere. That was the impression left not only on his mind, but on all who were with him. He was certain that if the people of this country realised that for the moment all our strength had to be put into establishing supremacy in the air in order to win victory at the front they would be prepared to take risks which, after all, were not comparable to the risks run by our soldiers.

The Germans were just as alive to the importance of supremacy in the air as we were. They had put forth prodigious efforts in the last 12 months. In the last six months we had enormously increased our capacity for turning out machines. We had extended existing works and built new ones, we had added over 23,000 men to the number of employees in those works, we had quickened production by improved methods of organisation and had enormously improved the type of machines. The Government's information was that the German capacity of production was not adequate to compete with the provision which they had made. Hitherto, however, the increase had only been gradual, as the measures taken at an earlier date by the Air Board and the Ministry of Munitions had not yet had time to reach their full fruition, but our production was now going up by leaps and bounds. We should, indeed, have been far better off at this moment but for the strike in April last, which lost us between 150 and 200 machines.

The Government now hoped soon to reach a state of things where it was possible not only to meet what must always be the first charge upon it, namely, the requirements of the Army in France, but also to provide sufficient aeroplanes to make it impossible for the Germans to come over here without losses which would persuade them that it was not worth while to do so. It was a very easy matter to go to poor people who had suffered and suggest that a raid like this was due to the negligence and carelessness of the Government, but he believed if those people were told what the situation was, they were capable of rising to a great appeal. If they were told that it was necessary to run some risks for a short time for the sake of the gallant fellows in France, they would do so cheerfully. It was only for a very short time, and he was confident that we could then not only secure supremacy in France, but also equip Lord French in such a fashion that if the Germans came over again they would deem it the part of wisdom not to repeat the attempt.

The Prime Minister concluded by moving the adjournment of the House.

THE DEBATE.

Mr. Joynson-Hicks suggested that if it was good business for the Germans to spare machines to bomb us and strike at the centre of our fighting forces it might be good business for us to spare machines in order to do the same. He suggested that more labour might be spared for the making of aircraft from other branches of munition work. He criticised the actual measures taken to cope with the raid, and asked for an inquiry.

Sir H. Dalziel also criticised the actual steps taken on Saturday, supporting the demand for an inquiry, and elicited the information that none of the raiders had come over London at a lower altitude than 13,000 ft. It was due to the great size of the machines that they appeared to be lower. He insisted that the expansion in our output of aeroplanes should have been secured earlier.

Colonel Sir J. Norton Griffiths pointed out that while it was possible to secure effective command of the air in the battle zone, it was impossible to secure a general command of the air. Even in the battle zone it was impossible to prevent enemy aeroplanes from coming over our lines. He gave his own experiences confirming the vital point that we maintained our supremacy at the front.

Mr. Claude Lowther asked for more cohesion between our air and land defences.

Sir W. Pearce expressed the view that the Government ought to take further steps for the defence of London.

Lord Hugh Cecil pointed out that London was far more accessible to the Germans than any large German centres were to us. We could bombard Brussels if we chose, but that would only injure a friendly population. The air problem was a purely military problem, and the judgment of the military experts ought to prevail.

The Chancellor of the Exchequer, answering questions put by **Mr. Lambert**, said that in the opinion of our experts our types of machines were as good as the Germans. He profoundly disagreed with the view expressed in the debate that the Prime Minister's speech might have been made in public, as the most vital though not the longest passages in it were essentially of a secret character. He pointed out that the French section of the Allied front was much nearer to important German cities than ours, and that it was therefore natural that the French should play a larger part in offensive operations against their cities, as indeed they had done with great success and remarkable immunity during the last few days, 84 machines having heavily bombed six German towns with only two casualties. He certainly did not treat these raids on London as of no importance, but it was the balance of military advantage that had to be considered, and if a choice had to be made the Army must come first. When people demanded the instant production of vast numbers of aeroplanes they were apt to forget the inherent limits to the extent and rate of such an increase and the imperative demands of other services.

The motion for the adjournment was talked out, and the House adjourned at 11.7 p.m.

[The official report above is of purely historical interest, and has little real bearing on the situation, the statement by the Ministers, and the debate, having been edited and censored till all important matter has vanished. One learns unofficially that the proceedings closed when Mr. Pemberton-Billing had told the House a few home truths. The Party Whips then, apparently, withdrew their obedient partisans, and the House was "counted out."—Ed.]

The Twin-Engined Gotha Biplane.

The following description of the Gotha bomb-dropper is taken from "L'Aérophile," of June 15th, M. Lagorgette having been given an opportunity of inspecting a recent capture:—

The span is 23.7 m. (77 ft.) and the length 12.45 m. (40 ft.).

The machine under discussion was the three-seater recently brought down by Capitaine Georges Guynemer. M. Lagorgette says that it does not give one the impression of being well tuned-up, and apparently the design has been modified without being remodelled. Without doubt, in the course of its construction, he says, several inspirations were imbibed from the Handley Page 500-h.p. Rolls-Royce 30 metre biplane captured by the Germans.

WINGS.—These are nearly equal in span, with projecting ailerons; there is a slight dihedral, but no stagger; there is a slightly arrowed shape, and the wings are nearly rectangular, and are cut away to a considerable extent along the centre part of the trailing edge so as to make room for the pusher air-screws.

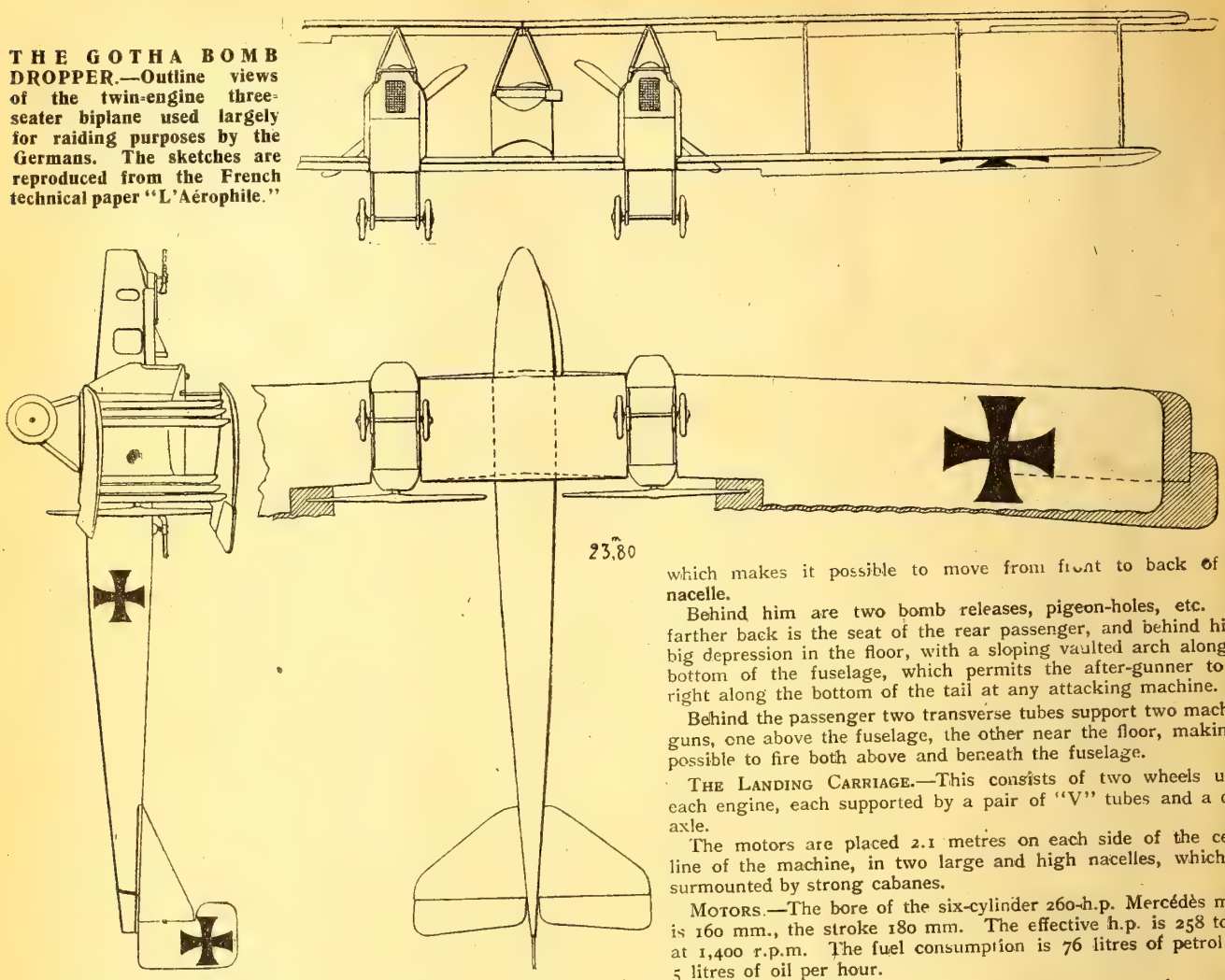
The ailerons are balanced, an angular portion extending past the wing tip and forwards acting as a compensator or balance. There are three pairs of struts on each side, besides those supporting the engines.

The elevator and fixed tail-plane have a semi-hexagonal plan view. The rudder is nearly rectangular, with a balanced portion projecting above the triangular fixed fin.

The fuselage is mounted on the lower wings and is rectangular in section, and of three-ply in front. The gunners, both front and rear, can fire downwards through trap-doors. In a compartment between them are three bomb releases. One pair of wheels are placed under each of the two motors, which are stationary Mercédès of 260 h.p. with six cylinders. The two airscrews are pushers, contrary to the usual German principle.

The height of the machine is 3.85 m. (about 12 ft.).

The span of the lower wings is 21.95 m., nearly equal to that



THE GOTHA BOMB DROPPER.—Outline views of the twin-engine three-seater biplane used largely for raiding purposes by the Germans. The sketches are reproduced from the French technical paper "L'Aérophile."

of the upper plane (23.7 m.), which includes the width of the ailerons, which are only on the upper planes.

The chord of the upper wings (2.3 m.) is slightly greater than that of the lower (2.2 m.) and they narrow gradually.

The gap is 2.17 m.

The total surface 95 square metres.

The length of the ailerons is 3.85 m. For 3.37 m. they increase in depth from 0.67 m. to 0.82 m.; for 0.48 m. they are 1.32 m. deep, where the overhanging section of the aileron is made deeper so that it will act as a counterpoise. The surface of each aileron is 3 square metres.

The upper plane consists of two halves, which are attached to the cabane, which is trestle-shaped. The lower plane has a long central section without dihedral or sweep back, which goes underneath the fuselage and at its extremities supports the motor units.

The attachments consist of simple wires with turnbuckles.

The spars are of I section with three-ply on the sides. They are cross-strutted by tubes.

The ribs indicate nothing new. They do not extend to the leading edge, which is attached solely by its own edges. Being at right-angles to the leading edges, which form a "V," they are not parallel to the axis of the machine.

For this reason the three pairs of struts which are found outside each motor have the peculiarity that the rear struts are not situated immediately behind the front struts, but, nevertheless, the streamline section of each faces the line of flight.

The fabric of the wings and of the tail is unbleached linen.

THE TAIL.—The fixed stabilising plane, or tail-plane, consists of two nearly triangular halves, the two elevator flaps are nearly rectangular, but taper slightly in width towards the centre.

The fixed tail-plane is triangular, held at four points, and extends to the rear of the fuselage, and behind that, above the level of the fuselage, is found the rudder, a rectangular member, the top portion extending forwards as a compensator.

THE FUSELAGE.—This is a single body of rectangular shape, with a three-ply nacelle which is very prominent in front. There are four ash longerons, with formers, or cloissons, on ash frames, with stringers to support the fabric.

The arrangement of the nacelle is not symmetrical. The front passenger sits nearly on the centre line of the machine, but the pilot with his controls, a wheel operating a chain and a rudder-bar, is placed to the left, which leaves on the right a passage which makes it possible to move from front to back of the nacelle.

Behind him are two bomb releases, pigeon-holes, etc. Still farther back is the seat of the rear passenger, and behind him a big depression in the floor, with a sloping vaulted arch along the bottom of the fuselage, which permits the after-gunner to fire right along the bottom of the tail at any attacking machine.

Behind the passenger two transverse tubes support two machine guns, one above the fuselage, the other near the floor, making it possible to fire both above and beneath the fuselage.

THE LANDING CARRIAGE.—This consists of two wheels under each engine, each supported by a pair of "V" tubes and a cross axle.

The motors are placed 2.1 metres on each side of the centre line of the machine, in two large and high nacelles, which are surmounted by strong cabanes.

MOTORS.—The bore of the six-cylinder 260-h.p. Mercédès motor is 160 mm., the stroke 180 mm. The effective h.p. is 258 to 260 at 1,400 r.p.m. The fuel consumption is 76 litres of petrol and 5 litres of oil per hour.

Each cylinder, precisely similar in appearance to the 175-h.p. type, is isolated, with its own water-jacket connected by a joint to its neighbour, and fixed separately to the crankcase, the six cylinders being in line.

A single carburettor, instead of the duplex pattern on the 175-h.p., and the two separate carburettors on the 235-h.p. model, feeds the six cylinders.

Two magnetos are driven by the vertical shaft which operates the camshaft. There are two plugs per cylinder and four valves. A half-compression device is fitted for easy starting.

There is a honey-comb radiator in front of each motor, and a petrol tank in each engine nacelle.

ARMAMENT.—The armament consists of three machine-guns, one in front in a turntable ring, which will fire through a hemisphere in front and a little over, above, and below. A second gun is mounted, as in the Aviatik, upon a transverse tube at the top of the fuselage, and behind the rear passenger, which can fire nearly vertically above and nearly perpendicularly below the machine.

A third, mounted similarly upon a transverse tube near the floor of the machine at the edge of the arched opening, makes it possible to fire underneath the vaulted fuselage, or obliquely to the sides, or to the rear.

The bomb-dropping instruments carry 14 bombs in all. One in the front of the fuselage, an affair with spring jaws, contains two bombs lying longitudinally.

Two others placed between the pilot and the rear passenger contain six bombs each, piled one upon the other in a rectangular chamber, so arranged that as the lowest bomb is released, it is followed successively by the other bombs.

MEDICAL COMFORTS BY AIR.

It is reported that the war organisation of the British Red Cross Society and the Order of St. John includes an aerial parcel post service. The following is an extract from a summary of work in Egypt which has reached the headquarters of the Joint War Committee at 83, Pall Mall, S.W. :—

"An aeroplane leaves a certain point in the Canal Zone daily and carries such Red Cross comforts as fans, fly whisks, chocolate, gramophones, etc., to outlying medical units in the desert

AFTER THE WAR.

BY "BERKELEY."

Even the pessimists who have done so much to assist this country in its march towards victory must perforce admit that in the fullness of time the present war will end, and peace will again become the habit of Europe. The war, after it had run a year of its course, was the cause of an almost complete revolution in the manner of life common to the greater mass of the people in this country. Those who were fit and available for service passed into His Majesty's Service that they might take an active part in the disintegration of the Germanic Empire. Others, unfitted by age or physical disability for active service beyond the seas, took up arms in the maintenance services attached to the forces. Others, again, from the highest to the lowest in the land, engaged themselves in the manufacture of munitions of war. Many who were prevented in various ways from directly aiding the country in its warlike endeavour remained in their seats of business, working under conditions of unusual stress, that commerce and its many offshoots should suffer as little as may be from the change in international conditions. Another class, variously employed, has done nothing, to the general good of the country.

The result in general is a great redistribution of money. Men and women accustomed for years past to a life of hardship, unlightened by variety and uninspired by hope, have at a bound attained an unexpected degree of prosperity. Those who were once well to do, but whose incomes could be classed under Mr. Lloyd George's broad definition of "unearned increment," have begun to tremble at the signs of the times and to shudder at the unpleasant evidence inscribed in the pages of their pass-books. There is some manner of revival of the days in which the South Sea Company, so soon to take its place in history as the South Sea Bubble, animated the thoughts of England. Footmen acquired in a moment the income proper to the rank and state of dukes, whilst dukes in the same period of time descended from their position of eminence and relied on crumbs from the Ministerial table of patronage for the means of existence. It's a world of topsy-turvy which would have delighted Lewis Carroll.

BEFORE THE WAR.

But in no industry or profession have things changed so much as in aeronautics. In pre-war days constructors of aircraft required private fortunes if they desired to avoid the doors of the Bankruptcy Court. Not only was support lacking, but they were regarded with similar suspicions to that surrounding a company of professional safe-breakers or a bookmaker who was known to have acquired many prizes in running matches. Those constructors who believed in the dirigible balloon had perforce to hide their thoughts, lest ill might come. The Royal Aircraft Factory alone was prosperous, while it remained the only establishment in which a profit was neither attainable nor necessary.

Those who became pilots from any reason save that of a desire to become an officer in either of the Flying Services could find no means of livelihood save in testing aeroplanes for manufacturers, or in a series of circus performances which showed a scale of profit in close relation to the degree of danger involved. Yet restricted though the employment of aviators might be, it had great promise of high profit. The skilled aviator could command an income comparable with that of a Cabinet Minister, and could claim far greater popularity with the general public.

Designers, mechanics, and others employed on construction were paid at rates little above those customary in allied industries. The entire personnel of the aeronautical industry was very limited, and increased but slowly. There was no market of any size save the Government, and, as the Government lacked belief in the paramount necessity for large numbers of aircraft in the Army and Navy, there was but little hope of rapid expansion in the trade.

THE EFFECT OF WAR.

The war has altered all. The aircraft industry is highly prosperous, and in size it bears comparison with its rival, the motor trade. Orders are placed in thousands, and the personnel engaged has increased to a degree which would have been deemed absurd in pre-war days. Constructors whose milk-bills were in arrear in 1914 now possess banking accounts which would be respected even by a Jermyn Street money-lender. Pilots are numbered in thousands instead of by dozens. The majority are in the King's Services, but those who are excluded for various reasons are, if still flying, earning incomes which would please a popular collaborator in revue-writing.

The war has brought its changes in the mode of life of the people. Peace in its turn will bring further changes, but few of them will be a return to the manners and customs of pre-war days. Nothing that is healthy remains stationary. Everything possessing virtue must progress. But evolution in normal times is slow. The dress clothes which clothe the gentleman and decorate the stockbroker are the development of centuries of evolution, as is the Rolls-Royce of to-day the descendant of the primeval sledge. The present war, instead of arresting development, is giving an impetus to evolution, which makes it possible almost to see the movement. Consequently, among other things, the aeronautical industry, which was in a state of unhealthy infancy at the beginning of the war, will at the advent of peace be a prosperous entity. A decade of evolution will be crowded into the three or four years of the war.

THE DESTINY OF THE YOUNG.

There were few people in pre-war days who, when the question of their son's employment after leaving school or the university was about to be decided, would have deliberately chosen any branch of aeronautics for his career, or would have encouraged any adolescent aspirations of that kind. It was all too uncertain and too indefinite. As for boyish desire for the life of an aviator, no decently conducted family would have given even reasonable hearing to the idea. Some entered the industry by the insistence of a strong will; others because they had no discernible attributes in any other direction, if even in any direction at all.

But to-day aeronautics is a definite industry, with the promise of a life-long career to any who will work with energy and perseverance. There are many categories of work within its bounds, and it is simply a question of choosing the most suitable sphere of activity.

It is unlikely that the present divorce between the construction of engines and the building of aeroplanes will continue in the future, when peace gives the opportunity for the co-ordination of effort. The production of the entire aeroplane will justify the creation of a separate trade of aeronautical engineering, in which will be combined all questions dealing with the designing and building of aeroplanes and airships. This being so, there will be many openings for the apprenticeship of boys to firms of aeronautical engineers, exactly as is now the custom in other branches of engineering. After a short period of train-

ing, the apprentice will be able to select the particular section of the trade which appeals most to his ability. In his perseverance and skill will lie the surest road to fortune. But the point to be made is that, after the war, aeronautical engineering can be added to the list of careers to be considered by parents in deciding the future occupation of their sons. It is an industry possessing stability. The element of financial risk will largely be eliminated.

If parents do not care for the charms and historic associations of apprenticeship, and desire to complete their children's education by the acquisition of a degree at one or other of the more modern universities, there is little doubt that in the course of the next few years a faculty of aeronautical engineering will find a place in at least the newer universities. That little attention has as yet been devoted to motor engineering in places of primary education is no argument against the inclusion of aeronautics from the system of training. There is an infinity of difference between the scientific positions of the two industries.

In a lower class in life there is a new field of work for those whom the Army very correctly calls "tradesmen." For mechanics, fitters, carpenters, and all manner of workmen whose category is unknown to me there is an infinity of work, with a definite promise of continuity of employment at a reasonable rate of pay. These men can become specialists in the industry no less than are the designers and draughtsmen, both of whom, I understand, wear black coats on Sundays.

The pilot, who until the present time has largely dominated the situation by his acrobatic skill and zeal for often dangerous experiments, will descend from his high estate in future days. No longer will the adventurous youth of good family find it a convenient and charming way of making a large income. The supposition that the art of flying required a singular degree of daring is rapidly vanishing, and the days are not far distant when paid aviators will be of the degree of paid chauffeurs and motor-drivers. The great commercial aeroplanes will be controlled by the hands of drivers whose skill will earn them a rate deservedly higher than that of the man who drives a motor-'bus, but it most certainly will not be disproportionately higher. The skipper in charge will rank in all probability with those of ships on the humbler sea, but he will rarely graduate from a course at the control levers. His duty will be that of command and of navigation.

There will still be money for the aviator who flies for the public amusement, just as there is for the equestrian performers in a circus. But the pilot will no longer be the idol of the public and the hero of the night club.

I have not referred to either of the Flying Services, as the officers and men therein must be considered as soldiers and sailors in the first instance. Their livelihood does not depend on aeronautics.

THE AERONAUTICAL EDUCATION OF SCOTLAND.

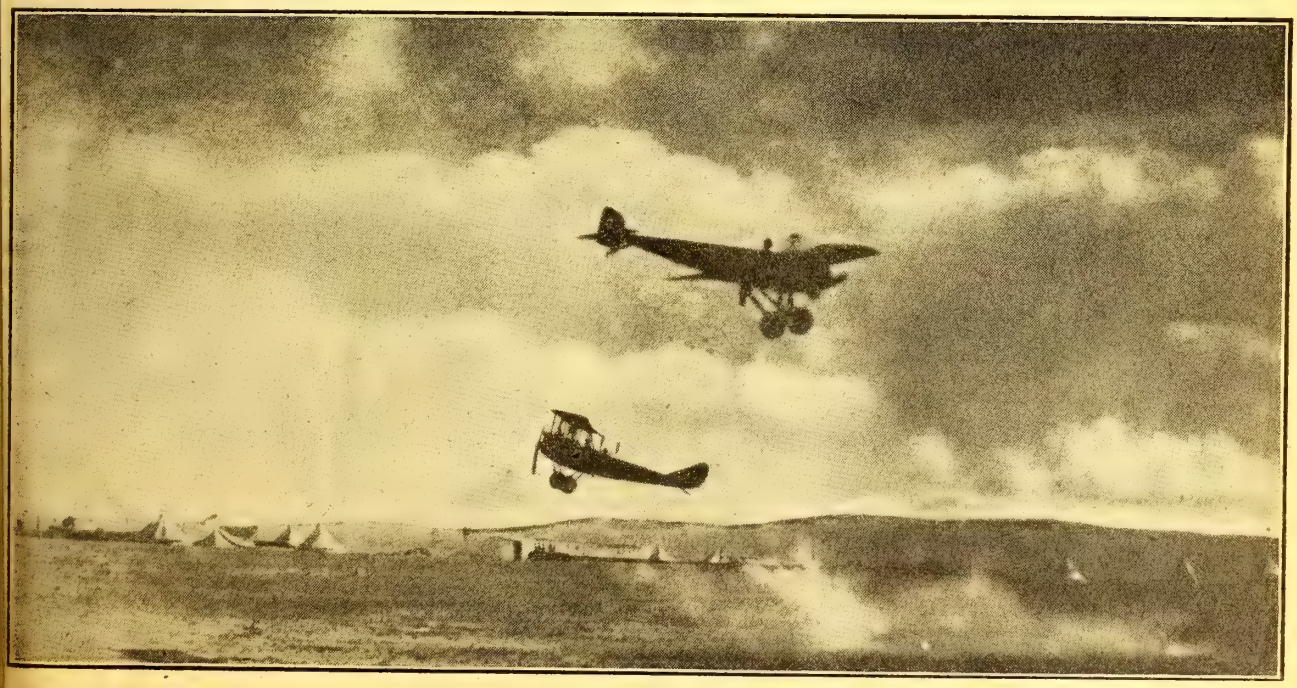
One learns with gratification that Lady Drogheda's Aeronautical History Exhibition has been an immense success in Glasgow. Among recent visitors were the Prime Minister and the C.-in-C. Home Forces. Mr. Lloyd George visited the Exhibition immediately after making his historic speech at Glasgow, and Lord French, who was on a journey of inspection in Scotland, visited the Exhibiton two days earlier. Both expressed their keen appreciation of the good work Lady Drogheda is doing in bringing home to the people of Great Britain the importance of aircraft.

As the result of this excellent lead, Glasgow has been flocking to the Exhibition in its thousands, and is rapidly acquiring desirable knowledge.

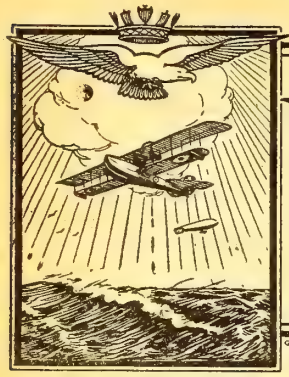
The Exhibition is shortly moving to Edinburgh, where it will be on view from July 20th till Aug. 3rd, after which date it will visit Dundee, where, one hopes, Mr. Churchill will take the opportunity of telling his constituents, and the country at large, something about aeronautical affairs

WAR WORK.

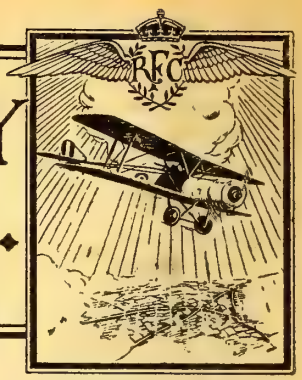
Two hundred women—under 40 years of age—are wanted at once in Somerset to pull flax to be used in the manufacturing of aeroplane fabric. The work begins on July 12th, and will last for six weeks. Payment at the rate of 30s. an acre is offered, a rate at which the minimum earnings will well cover the living expenses. Good accommodation is offered, and there is a canteen, but the workers must provide certain small items of equipment. The scheme is being run by the Women's Land Service Corps for the Board of Agriculture, and applications should be made to 50, Upper Baker Street, London, N.W.1.



THE GERMAN AERODROME AT BIR SABA—the Beersheba of the Old Testament. An Aviatik is seen getting off, and a Pfalz monoplane, which is an exact copy of a Morane, is seen in the fore-air.



NAVAL and MILITARY AERONAUTICS



FROM THE "LONDON GAZETTE."

WAR OFFICE, July 3rd.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Flt. Comdrs.—From Flying Officers: Lt. H. A. Fordham, North'd Fus., and to be temp. Capt. whilst so empld., June 14th, 1917. June 17th, 1917: Lt. (temp. Capt.) C. T. Vachell, Mon. R., T.F., and to retain his temp. rank whilst so empld. From Flying Officers, and to be temp. Capts. whilst so empld.: Temp. Lt. C. Fairbairn, Gen. List; Sec. Lt. M. Johnstone, Spec. Res., June 21st, 1917.

SCHOOLS OF MILITARY AERONAUTICS.—Instr. (graded as an Equipt. Officer, 1st Cl.).—Sec. Lt. (temp. Lt.) G. J. Read, N. Staff. R., Spec. Res., from a Flying Officer, and to be temp. Capt. whilst so empld., Sept. 19th, 1916 (substituted for the notification in the "Gazette" of Dec. 11th, 1916).

ADMIRALTY, July 4th.

R.N.V.R.—The undermentioned have been promoted for services with the R.N.A.S.—Temp. Lt.-Comdrs. to be temp. Comdrs.: Cecil H. Meares, Claude Kirby, June 30th, 1917.

Temp. Lts. to be temp. Lt.-Comdrs: Philip L. Teed, George C. Neilson, George F. Herron, William Burningham-White, Edmund Hogg, Edward R. Peal, D.S.C., Spenser Flower, Edward N. G. Morris, Victor C. H. Longstaffe, Percy L. H. Dodson, Joseph E. Coates, Rowland D. Carey, Pearce Blair, Charles H. Parkes, Harold G. Atkinson, Viscount Tiverton, John K. Curwen, William J. S. Lockyer, William G. Chambers, Thomas F. Norbury, William H. Adkins, Frederick T. Ashford, Arthur Partridge, Cyril R. Andrews, Charles R. Abbott, George M. T. Rees, Charles J. Murfitt, Arthur F. Sidgreaves, Michael H. P. Allen, James D. K. Restler, James P. A. Waller, Henry A. R. Norton, Rene Bull, Alfred S. Hellawell, Arthur S. Langley, Warwick Wright, June 30th, 1917.

Temp. Sub-Lts. to be temp. Lts.: John D. Greenwood, April 1st, 1917. Joseph T. Chitty, Colin A. Crow, Herbert G. P. Rees, Charles H. Nelson, Arnold L. Howarth, Arthur B. Hatton, Bernard J. Beeton, John Ree, Sidney H. Brazier, Noel V. Wrigley, Richard F. Osborne, Clive C. Clarke, Edward A. Wadsworth, Arthur J. Osborn, Harry C. Willson, Charles F. Smith, Noel W. Hughes, James D. Fry, James D. Whitelaw, Archibald A. Bryce Buchanan, Hermes G. L. de Whalley, Arthur M. Humble-Crofts, Arthur E. Murray, Horace O. Merriman, Clement H. Swann, Percival M. Davson, John W. Morley, William T. Morris, June 30th, 1917.

R.N.A.S.—Sqdn. Comdr. to be Wing Comdr.: Wilfred Briggs, June 30th, 1917.

WAR OFFICE, July 4th, 1917.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Sqdn. Comdr.—Temp. Lt. (temp. Capt.) C. F. Portal, M.C., R.E., Spec. Res., from a Flight Comdr., and to be temp. Maj. whilst so empld., June 16th, 1917.

Flt. Comdrs.—From Flying Officers: Temp. Sec. Lt. (temp. Lt.) I. G. Davies, Gen. List, and to be temp. Capt. whilst so empld., May 30th, 1917. June 18th, 1917: Lt. (temp. Capt.) G. M. Croil, Gord. H., T.F., and to retain his temp. rank whilst so empld.; Capt. E. A. de Pass, Yeo., T.F. From Flying Officers, and to be temp. Capts. whilst so empld.: Temp. Sec. Lt. (temp. Lt.) C. H. Stocks, Gen. List, June 20th, 1917. Lt. M. D. G. Scott, N. Lan. R., Spec. Res., June 21st, 1917.

Park Comdr.—Qmr. and Hon. Lt. (temp. Capt.) J. Starling, R.F.C., and to be temp. Maj. whilst so empld., May 1st, 1917 (substituted for the notification in the "Gazette" of May 24th, 1917).

Equipt. Officers, 1st Cl.—Sec. Lt. (temp. Lt.) A. D. Spiers, Spec. Res., from the 2nd Cl., and to be temp. Capt. whilst so empld., May 19th, 1917.

MEMORANDA.—Temp. Lt.-Comdr. Clement Rolfe Ingleby, from R.N.V.R., for duty with R.F.C., May 14th, 1917. Capt. the Hon. M. Baring, R.F.C., Spec. Res., whilst specially empld., July 5th, 1917. To be temp. Majors.

WAR OFFICE, July 4th.

REGULAR FORCES.—R.F.C.—MIL. WING.—The following appointments are made:—

Special Appointment (graded as a Sqdn. Comdr.).—Temp. Sec. Lt. (temp. Capt.) R. M. Hill, M.C., Gen. List, a Flt. Comdr., and to be temp. Maj. whilst so empld., April 1st.

TERRITORIAL FORCE.—YEOMANRY.—Capt. W. S. F. Johnson, M.C., to be secd. for duty with R.F.C., April 29th.

* * *

Dispatches from Sir Archibald Murray are published covering the operations in Egypt from Oct. 1st, 1916, to Feb. 28th, 1917. During this period Sinai was cleared of the Turks, and the Egypt force won the brilliant victories of Magdhaba and Rafa, in both of which the whole of the Turkish force engaged was either captured or otherwise accounted for. These were the last important actions fought before the Battle of Gaza.

The following R.F.C. Officers and Men appear in the list of recommendations made in General Murray's dispatch:—

STAFF.—Salmond, Bt. Lt.-Col. (temp. Brig. Gen.) W. G. H., R.A. and R.F.C.

ROYAL FLYING CORPS.—Bannatyne, Lt. (temp. Maj.) E. J. Burchall, Capt. (temp. Maj. in Army) H., R.F.C. (Spec. Res.); Freeman, Capt. R. H., Worc. R.; Guilfoyle, temp. Capt. W. J. Y.; Kingsley, temp. Lt. S. G., Gen. List; Muir, temp. Capt. S. K.; Bradwell, 3206 Flt. Sgt. W. A.

AUSTRALIAN IMPERIAL FORCE—AUSTRALIAN FLYING CORPS.—Jones, Capt. A. M.; Sheldon, Capt. W.; Wackett, Lt. L. J.; Gibbs, 156 Flt. Sgt. E. A., 67th Squad.; Murphy, War. Officer A. W., 67th Squad.

WAR OFFICE, July 6th.

REGULAR FORCES—ESTABLISHMENTS—R.F.C.—MIL. WING.—Flt. Comdr.—Temp. Sec. Lt. H. P. Dean, Gen. List, from a Flying Officer, and to be temp. Capt. whilst so empld., June 23rd, 1917.

Equipment Officers, 1st Cl.—Lt. (temp. Capt.) C. Ingram, Cyclist Bn., T.F., from the 3rd Cl., and to retain his temp. rank whilst so empld., May 20th, 1917. Sec. Lt. (temp. Lt.) O. W. Latimer, from the 2nd Cl., and to be temp. Capt. whilst so empld., June 15th, 1917.

WAR OFFICE, July 7th.

REGULAR FORCES.—ESTABLISHMENTS.—R.F.C.—MIL. WING.

Sqdn. Comdr.—Lt. (temp. Capt.) J. A. G. de Courcy, M.C., R.A., from a Flt. Comdr., and to be temp. Maj. whilst so empld., June 4th.

WAR OFFICE, July 9th.

REGULAR FORCES.—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Sqdn. Comdr.—Capt. C. H. B. Blount, M.C., R.W. Surr. R., from a Flt. Comdr., and to be temp. Maj. whilst so empld., June 26th.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld.:—Temp. Lt. F. P. Holliday, Gen. List, June 15th. Sec. Lt. (temp. Lt.) A. G. A. Davis, Devon R., June 20th.

Balloon Co. Comdrs. (graded as Flt. Comdrs., and to be temp. Capts. whilst so empld.). Sec. Lt. (temp. Lt.) B. G. L. Ellis, R. Guernsey Mila., from a Balloon Officer, June 9th. Sec. Lt. (temp. Lt.) J. A. Cochrane, R. Sco. Fus., T.F., from a Balloon Comdr. (graded as a Balloon Officer), June 16th.

Adjt.—Temp. Capt. A. M. Lester, Midd'x R., vice temp. Sec. Lt. (temp. Lt.) J. Rubie, D. Gds., May 18th.

Equipment Officers, 1st. Cl.—Lt. G. E. Godsave, Lond. R., T.F., from the 2nd Cl., and to be temp. Capt. whilst so empld., June 25th.

* * *

The King has been pleased to award the Military Medal for bravery in the field to the following Non-commissioned Officers and Men:—

77449 Sgt. B. Aldred, R.F.C.
5303 Cpl. E. Harper, R.F.C.
9236 1st Cl. Air Mech. H. J. Hayes, R.F.C.
4251 1st Cl. Air Mech. N. Parkinson, R.F.C.
12270 1st Cl. Air Mech. J. Thompson, R.F.C.
1197 Cpl. R. E. Tollerfield, R.F.C.

NAVAL.

The following appointments have been made in the Royal Naval Air Service :—

JULY 5th.—Messrs. G. B. Mann, A. W. Stone, and W. Seed granted temp. commissions as Lieut., R.N.V.R., all with seniority July 3rd.

JULY 6th.—Sqdn. Comdr. (Actg. Wing Comdr.).—W. Briggs, promoted to rank of Wing Comdr., seny. June 30th.

Lt.-Comdrs. (temp., R.N.V.R.).—C. H. Meares and C. Kirby, both promoted to Comdrs. (temp.) seny. June 30th.

Lts. (temp. R.N.V.R.).—P. L. Teed, G. C. Neilson, G. F. Herron, W. Burningham-White, E. Hogg, E. R. Peal, D.S.C.; S. Flower, E. N. G. Morris, V. C. H. Longstaffe, P. L. H. Dodson, J. E. Coates, R. D. Carey, H. G. Atkinson, P. Blair, C. H. Parkes, Viscount Tiverton, J. H. Curwen, W. J. S. Lockyer, W. G. Chambers, T. F. Norbury, W. H. Adkins, F. T. Ashford, A. Partridge, C. R. Andrews, C. R. Abbott, G. M. T. Rees, C. J. Murfitt, A. F. Sidgreaves, M. H. P. Allen, J. D. K. Restler, J. P. A. Waller, H. A. R. Norton, R. Bull, A. S. Hellawell, A. S. Langley, and W. Wright, all promoted to Lt.-Comdrs. (temp.), seny. June 30th.

Sub-Lts. (temp., R.N.V.R.).—J. D. Greenwood, promoted to Lt. (temp.), seny. April 1st. J. T. Chitty, C. H. Nelson, A. L. Howarth, A. B. Hatton, B. J. Beeton, J. Ree, S. H. Brazier, N. V. Wrigley, R. F. Osborne, C. C. Clarke, E. A. Wadsworth, A. J. Willson, C. F. Smith, N. W. Hughes, J. D. Fry, J. D. Whitelaw, A. A. Bryce-Buchanan, H. G. J. de Whalley, A. B. Murray, C. H. Swann, P. M. Davson, J. W. Morley, C. A. Crow, H. G. P. Rees, A. M. Humble-Crofts, and W. T. Morris, all promoted to Lt. (temp.) seny. June 30th.

JULY 7th.—Mr. H. D. Stanton, granted temp. comm. as Lt. (R.N.V.R.), seny. July 9th.

JULY 9th.—The following temp. entries (R.N.V.R.) have been made, seny. as stated :—Lieuts.—F. R. Arthur, July 5th. E. W. Wilkins, July 7th.

Mr. E. H. Cook granted a temp. commission as Lt. (R.N.V.R.), seny. July 5th.

ADMIRALTY COMMUNIQUÉS.

JULY 4th.—The Secretary of the Admiralty makes the following announcement :—

During the night of the 2nd and morning of the 3rd inst., bombing raids were carried out on Bruges Docks and on Lichtervelde ammunition depots by Royal Naval Air Service machines. Several tons of bombs were dropped in all, and good results were observed.

All our machines returned safely.

ADMIRALTY, 7 p.m.

Vice-Admiral, Dover, reports that naval aircraft from Dunkirk intercepted the hostile squadron returning from England after the attack on Harwich this morning. An engagement ensued at a considerable distance from the Belgian coast.

Two of the hostile machines were brought down in flames, and a third was seen to be damaged. Several other machines were attacked with indecisive results.

All our machines returned safely.

JULY 5th.—The Secretary of the Admiralty makes the following announcement :—

During the night of the 3rd-4th bombing attacks were carried out by Royal Naval Air Service machines on the aerodromes at Ghistelles (south-west of Bruges) and Nieumunster (north-west of Bruges), also on the Ostend seaplane sheds and on a train at Zarren (east of Dixmunde). Several tons of bombs were dropped.

All our machines returned safely.

JULY 7th, 5.55 p.m.—The enemy raiding squadron was chased by Royal Naval Air Service machines from this country and engaged 40 miles out to sea off the East Coast.

Two enemy machines were observed to crash into the sea. A third enemy machine was seen to fall in flames off the mouth of the Scheldt. All our machines returned safely.

[This does *not* agree with the German communiqué.—Ed.]

7.35 p.m.—Vice-Admiral, Dover, reports from Dunkirk :—

On information being received that enemy aircraft were attacking England, five flights were sent up to intercept them as they returned.

The raiding enemy aircraft were not seen, but three enemy seaplanes were encountered and destroyed, and one enemy aeroplane was driven down into the sea and another enemy aeroplane driven down.

The machines returned to replenish petrol and left again immediately. In the course of this patrol one enemy aeroplane was brought down in flames and another forced to land on the beach damaged near Ostend.

During the course of their operations none of the raiding enemy aeroplanes were encountered, and it is thought highly probable that they returned near the Scheldt and over Dutch territory.

[It is thought highly probable, then, that Vice-Admiral Bacon's machines did not go far enough to look for them.—Ed.]

JULY 8th.—A bombing flight of Royal Naval Air Service machines carried out a raid last evening (July 7th) on Ghistelles Aerodrome. Although heavily attacked by a hostile formation, bombs were successfully dropped on the objectives.

All our machines returned safely.

THE CASUALTY LIST.

Reported July 4th.

R.N.A.S.—DROWNED.—King, A. E., Air Mech., 1st Gde., F.4373.

Reported July 5th.

DIED OF WOUNDS.—Orfeur, Observer Sub-Lt. Charles B., R.N.

PREVIOUSLY REPORTED MISSING, NOW OFFICIALLY REPORTED KILLED.—Eppstein, Flt. Sub-Lt. Maurice W. W., R.N.

PREVIOUSLY REPORTED MISSING, NOW OFFICIALLY REPORTED PRISONER.—Walker, Flt. Sub-Lt. William R., R.N.

Reported July 9th.

KILLED.—Allan, Flt. Sub-Lt. H., R.N.

ACCIDENTALLY KILLED.—Flynn, Prob. Flight Officer H. J., R.N.

ACCIDENTALLY INJURED.—Clifford, Flt. Lt. R. M., R.N.

SLIGHTLY INJURED.—Blaxhill, Prob. Flt. Officer Alec E., R.N.

PERSONAL NOTICES.

DEATHS.

ALLAN.—Flt. Sub-Lt. Hugh Allan, R.N., who was killed on July 6th, was the only son of Lt.-Col. Sir H. Montagu Allan, C.V.O., and Lady Allan, Ravenscrag, Montreal, Canada. He was aged 20.

DUNCAN.—Flight Sub-Lieut. David Alan Duncan, R.N.A.S., was the only child of Lieut. G. H. F. Duncan, of 3, York House, Kensington, and Afton Lodge, Freshwater, Isle of Wight, and formerly of Valparaiso, Chile, and the late Mrs. G. H. F. Duncan. He was 21 years of age. Mr. Duncan, who was killed in an accident while flying on June 2nd, was born at Valparaiso, and was educated at the Charterhouse, Trinity College, Cambridge, and Sandhurst. He entered the cavalry in 1915, and subsequently joined the R.N.A.S.

FLYNN.—Probationary Flight Officer Harold John Flynn, R.N., was killed on July 5th while flying in East Kent. At a height of about 1,000 feet, his machine suddenly dipped and crashed to earth.

SIMS.—Flt. Sub-Lt. James Theodore Sims, R.N.A.S., who was killed on May 26th, aged 30, as the result of an accident while flying, was the elder son of the late James Sims and Mrs. Sims, of Redruth, Cornwall. He was educated at Plymouth College, and afterwards proceeded to West Africa, where he became the manager of a mine. He was at home on leave at the outbreak of war, and at once enlisted in the D.C.L.I., but obtaining a commission as sub-lieutenant, R.N.V.R., joined the Royal Naval Air Service in October, 1915, as an observer. After training he was sent to Dunkirk and distinguished himself by the photographs he took in the air under heavy shell fire, receiving the Croix de Guerre (with Palm) and being presented to the King by the Vice-Admiral in Command. Early this year he applied to be trained as a pilot and became probationary flight officer, being afterwards promoted flight sub-lieutenant.

MARRIAGE

ARNOLD — FREWER.—On July 2nd, at St. Patrick's Church, Hove, by the Rt. Rev. Bishop Goldsmith, D.D., Vicar of Hampstead, uncle of the bride, assisted by the Rev. Cyril C. Frewer, Rector of Brede, brother of the bride, Flight. Lieut. Harwood J. Arnold, D.S.O., R.N., younger son of the late Capt. O. J. H. Arnold, was married to Dorothy, daughter of the Rev. Canon G. E. Frewer, Prebendary of Fittleworth in Chichester Cathedral, and Mrs. Frewer, of Furze Hill, Hove, Sussex.

BIRTH.

BOUSFIELD.—On July 6th, 1917, at 180, Lincoln Road, Peterborough, the wife (née Gladys Toft) of Lieut. M. D. Bousfield, R.N.V.R., attd. R.N.A.S., of a daughter.

It has been announced that the star worn on the sleeve by graded officers of certain ranks in the Royal Naval Air Service is to be of the same size and design as the epaulette star worn by officers below the rank of rear-admiral, but in gold instead of in silver. On the shoulder-strap the star will be of a similar pattern, but of one-half the diameter. The two stars worn by squadron commanders of less than eight years' seniority as flight lieutenant, flight commander, and squadron commander will be worn in a vertical line on the sleeve and in a horizontal line on the shoulder-strap.

MILITARY.

G.H.Q. COMMUNIQUÉS.

JULY 3rd, 9.0 p.m.—Hostile aerial activity has shown marked increase during the past few days. Successful artillery work and bombing raids were carried out yesterday by our aeroplanes.

One German aeroplane was brought down in our lines by

gun fire, three more were brought down in air fighting, and two others driven down out of control.

One of our machines is missing.

July 4th, 9.25 p.m.—The enemy's aerial activity still continues. In air fighting yesterday three enemy machines were brought down, and five others were driven down out of control. Another hostile machine was shot down by our anti-aircraft guns.

One of our aeroplanes failed to return.

July 7th, 9.40 p.m.—There was much aerial fighting yesterday, chiefly on the front between Lens and Ypres. In this area the enemy's machines were encountered in large numbers, one formation being composed of as many as 30. Despite this pronounced activity on the enemy's part, we bombed his aerodromes during the day, causing damage, and carried out successful artillery work and photography.

The activity was continued by bombing during the night, in which the enemy showed more enterprise than he has hitherto done. He dropped 144 bombs on our side of the line, our bombing machines meanwhile dropping nearly three times that number on his side.

In the fighting during the day eight hostile machines were brought down and six others were driven down out of control.

Five of our machines are missing.

July 8th, 8.52 p.m.—Yesterday the enemy again displayed activity in the air and fighting was continued throughout the day. Hostile aircraft worked in large formations, which were frequently broken up by our pilots.

Our aviators carried out a number of successful raids, in the course of which the enemy's aerodromes, depots, and troops were attacked with bombs and machine-gun fire and considerable damage was done.

Six enemy machines were brought down in combat and 10 more were driven down out of control.

Eight of our machines are missing.

War Office Communiqué

July 6th.—The G.O.C. Macedonia reports :—

Our aeroplanes have bombed Drama, Porna, and Angista stations (all in the Struma Valley), the aerodrome at Drama, and camps and dumps at other places. Altogether during the month of June 19 tons of explosives were dropped by us and considerable damage was inflicted.

A hostile machine was brought down by our anti-aircraft guns near Akindzali (north-east of Lake Doiran), and was afterwards destroyed by artillery fire and aeroplanes' bombs.

Home Command Communiqués.

July 4th, 8.15 a.m.—Enemy aeroplanes appeared over the Essex coast about 7 a.m. Our anti-aircraft guns came into action.

Some bombs have been dropped, but no details as yet have been received.

12.15 p.m.—A squadron of some 12 to 14 enemy aeroplanes attacked Harwich from a north-easterly direction at about 7.5 a.m. this morning.

A number of bombs were dropped, and the latest reports state that eight persons were killed and 22 injured.

Only slight material damage was caused.

Fire was opened from the anti-aircraft defences and the enemy's formation was broken up, although low-lying clouds rendered visibility very bad. The raiders were also engaged by our own aircraft from a neighbouring station.

After dropping their bombs the enemy's squadron turned seawards without attempting to penetrate inland. The whole raid only occupied a few minutes.

July 7th, 11.45 a.m.—At about 9.30 a.m. this morning hostile aircraft in considerable numbers and probably in two parties appeared over the Isle of Thanet and the East Coast of Essex.

After dropping some bombs in Thanet the raiders proceeded in the direction of London, moving roughly parallel to the north bank of the Thames. They approached London from the north-east; then, changing their course, proceeded north and west and crossed London from north-west to south-west. Bombs were dropped in various places in the metropolitan area.

The number of raiding aeroplanes is at present uncertain, but was probably about 20. They were attacked by artillery and by large numbers of our own aeroplanes, but reports as to the results of the engagements as to damage and casualties have not yet been received.

6.30 p.m.—The total casualties reported by the police at present are as follows :—

Killed.

	Men.	Women.	Children.	Total.
Metropolitan area	27	4	3	34
Isle of Thanet	1	2	0	3
				37

Injured.

Metropolitan area	74	29	36	139
Isle of Thanet	0	1	1	2
				141

One of the enemy machines was brought down by the Royal Flying Corps and fell into the sea off the mouth of the Thames.

[This agrees with the German communiqué.—Ed.]

July 9th.—The latest police reports show the following revised list of the casualties which resulted from the air raid of July 7th :

Killed.

	Men.	Women.	Children.	Total.
Metropolitan Area	29	6	5	40
Isle of Thanet	1	2	—	3
				43

Injured.

	Men.	Women.	Children.	Total.
Metropolitan Area	98	44	52	194
Isle of Thanet	—	2	1	3
				197

The Casualty List.

Reported July 4th.

Killed.—Tootell, Sec. Lt. B., Sher. For. and R.F.C.

Wounded.—Nicholls, Sec. Lt. W. G., R.F.C.
Thorne, Lt. A. B., R.F.A., attd. R.F.C.

Missing.—McNaughton, Capt. N. G., M.C., R.F.C.
Mearns, Lt. A. H., Black W., attd. R.F.C.
Sturgess, Sec. Lt. T. M., R.F.C.

Previously reported Missing, now reported Wounded, and a Prisoner in German Hands.—Toogood, Sec. Lt. J., R.F.C.

Indian Forces.—Missing.—Leslie-Moore, Lt. A., I.A.R., attd. R.F.C.

Reported July 5th.

Killed.—Power-Clutterbuck, Sec. Lt. J. E., R.F.A., attd. R.F.C.

Previously reported Missing, now reported Killed.—Cowan, Capt. S. E., M.C., R.F.C.

Wounded.—Hart, Sec. Lt. E. W., Cyclist Bn. and R.F.C.
Wright, Capt. A. B., Highland L.I., attd. R.F.C.

Missing.—Holt, Capt. W. P., A.S.C. and R.F.C.

Died of Wounds.—R.F.C.—Holt, 8580 2nd Cl. Air Mech. A. J. (Nuneaton).

Died.—Taylor, 30029 1st Cl. Air Mech. J. A. S. (Shoreham, Sevenoaks).

Reported July 6th.

Killed.—Bowman, Lt. L. S., R. Lanc. R. and R.F.C.
Street, Lt. C., R.F.C.

Previously reported Missing, now reported Killed.—Crawford, Sec. Lt. W. C., R.F.C.
Doughty, Sec. Lt. G., R. Scots, attd. R.F.C.
Hawker, Maj. L. G., V.C., D.S.O., R.E., attd. R.F.C.
Lewis, Sec. Lt. E. L., Essex R. and R.F.C.
Knight, Capt. A. G., R.F.C.
Reid, Sec. Lt. A. W., M.C., K.O.S.B., attd. R.F.C.
Scott, Capt. C. L. M., S. Staff. R., attd. R.F.C.
Spanner, Capt. H., R.F.C.
Watts, Sec. Lt. A. E., R.F.C.

Died of Wounds.—Ross, Sec. Lt. P. C., R.F.C.
Ryder, Sec. Lt. R. V., Glouc. R., attd., R.F.C.

Wounded.—De Beer, Sec. Lt. C. L., R.F.C.
Dent, Sec. Lt. A. C., Yeo., attd. R.F.C.
Macnab, Lt. A. J., A. and S. H., attd. R.F.C.

Previously reported Prisoners, now reported Wounded and Prisoners in German Hands.—Frew, Sec. Lt. J. G. H., R.F.C.
Hamilton, Sec. Lt. H. D., R.F.C.
Wilson, Sec. Lt. F. H., R.F.C.

Previously reported Missing, now reported Wounded and Prisoner in German Hands.—Watson, Sec. Lt. A., R.F.C.

Previously reported Missing, now reported Prisoners in German Hands.—Allabarton, Sec. Lt. S. F., R.F.C.
Boote, Sec. Lt. R. S. L., R.G.A., attd. R.F.C.
Cameron, Lt. D. R., R.F.C.
di Balmé, Sec. Lt. Count L. T. B., R.F.C.
Furlonger, Sec. Lt. C. A. M., R.F.C.
Hadrill, Sec. Lt. G. C. T., A.S.C., attd. R.F.C.
Hair, Sec. Lt. N. B., R.F.C.
Illingworth, Sec. Lt. F. W., Sco. Rif., attd. R.F.C.
Lane, Sec. Lt. C. W., K.R.R.C., attd. R.F.C.
Marsh, Sec. Lt. R. M., R.F.C.
Shaw, Lt. J. W., R.F.C.
Steeves, Sec. Lt. D. T., R.F.C.
Waters, Sec. Lt. H. E., R.F.C.

Reported July 7th.

Wounded.—McGregor, Sec. Lt. G. S., R.F.C.
Robinson, Sec. Lt. N. D., R.F.C.

Missing.—Simon, Lt. G. P., R.G.A., attd. R.F.C.

Previously Missing, now reported Killed.—R.F.C.—Bellerby, 17018 Sgt. K. (Chingford).

Reported July 9th.

Killed.—Goodyear, Lt. D. M., R.F.C.
Hunstone, Sec. Lt. G. N., R.F.C.
Kay, Sec. Lt. G. P., R.F.C.

Martin, Sec. Lt. F. R., R. Scots Fus., attd. R.F.C.
Mountford, Capt. G., N. Staffs R. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Kimbell, Sec. Lt. R. E., Hussars, attd. R.F.C.

DIED OF WOUNDS.—Wylde, Lt. T. E., Norf. R. and R.F.C.

ACCIDENTALLY KILLED.—Grace, Sec. Lt. A. A. G., R.F.C.

WOUNDED.—Duncan, Sec. Lt. H. D, R.F.C.
Holland, Capt. W. T. F., Lcrs., attd. R.F.C.
Watt, Sec. Lt. W. E., Cav. S.R., attd. R.F.C.

MISSING.—Bird, Sec. Lt. D. J. de A., R.F.A. and R.F.C.
Lowe, Lt. M., R.F.C.
Murray, Lt. D. C. G., R.E. and R.F.C.
Vipond, Sec. Lt. F. E., Manch. R. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED MISSING, BELIEVED KILLED.—Devenish, Lt. G. W., R.F.A., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED WOUNDED AND PRISONER IN GERMAN HANDS.—Adeney, Sec. Lt. R.E., Queen's (Royal West Surrey Regt.), attd R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Southorn, Lt. T. M., R.F.A. and R.F.C.

PREVIOUSLY REPORTED PRISONER, NOW REPORTED WOUNDED AND PRISONER IN GERMAN HANDS.—Holland, Sec. Lt. C. B., R.F.C.

PRISONER IN GERMAN HANDS.—Frame, Lt. G. S., Royal Engineers, attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Newenham, Sec. Lt. G. A., R.F.C.

CORRECTIONS.—Eyton-Lloyd, Sec. Lt. J. W., R.F.A., reported killed, should read:—Eyton-Lloyd, Sec. Lt. J. W., R.F.C.
Scott, Capt. C. L. M., S. Staff R., attd. R.F.C. (previously reported missing, now reported killed), should read Scott, Capt. C. L. M., N. Staff R., atid. R.F.C.

DIED OF WOUNDS.—R.F.C.—Brush, 5524 1st Cl. Air Mech. L. T (Highbury, N.)
Stuckey, 44738 2nd Cl. Air Mech. R. W. (Clevedon).

DIED.—R.F.C.—Crocker, 36992 2nd Cl. Air Mech. P. (Park)
Poulter, 51345 2nd Cl. Air Mech. F. (South Farnborough).

HOME FORCES.—JUNE 9th.—MISSING.—R.F.C.—Dangerfield, 170 Sgt. J. (Shepherds Bush, W.); Dunn, 6396 Sgt. R. (Wokington); Harvey, 52315 2nd Cl. Air Mech. E. D. (Havant); Walker, 28707 2nd Cl. Air Mech. J. (Rutherglen).

CANADIAN CONTINGENT.—ACCIDENTALLY KILLED.—Wheatley, Lt. L. A. Saskatchewan R., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Harvey, Lt. J. B., Cent. Ont. R., attd. R.F.C.
Kantel, Lt. F. W., Can. F.A., attd. R.F.C.

PERSONAL NOTICE.

DEATHS.

BOWMAN.—Lt. Leslie Spencer Bowman, King's Own (Royal Lancaster) Regt. and R.F.C. (killed in action on June 25th), was 20 years of age, and the only son of Dr. and Mrs. Bowman, of Ulverston. He had his lieutenancy in September, 1916, and was gazetted Flying Officer the same month.

CLEAVER.—Lt. Eric Arnold Cleaver, East Yorks, attached R.F.C., who was killed in action on July 3rd, was the fifth son of Mr. R. S. Cleaver, of Liverpool.

COLE-HAMILTON.—On July 2nd, at London Colney, Capt. C. W. E. Cole-Hamilton, Royal Scots and R.F.C., was killed while flying. He was the only son of the late Capt. W. A. T. Cole-Hamilton, R. Irish Fusiliers, and Mrs. Cole-Hamilton, Norfolk Hotel, S.W. It was stated at the inquest held at Napsbury War Hospital, near St. Albans, on July 3rd, that he was flying at a height of 5,000 feet and at a rate of 160 miles an hour, when the machine swerved to the right and got out of control. He was the officer commanding the aerodrome.

COWAN.—Capt. Sidney Edward Cowan, M.C., R.F.C. (previously reported missing, now reported killed), was awarded the Military Cross in May, 1916, when the "London Gazette" stated:—"He dived onto an enemy machine in the enemy's lines and drove it to the ground, where it was smashed, and then circled round and fired at the pilot and observer as they ran for shelter. Although forced to land through his engine stopping, he contrived to restart it and got back under heavy fire."

In the following October he was given a bar to his Cross "for conspicuous gallantry and skill. He has done fine work in aerial combats, and has shot down four enemy machines." And then last November he was awarded a second bar for "conspicuous gallantry in action. He fought a long contest with seven enemy machines, finally bringing one down in flames. He had displayed great skill and gallantry throughout."

Capt. Cowan entered the R.F.C. in August, 1915, and was gazetted flying officer in the following October. He was appointed flight commander in October last year, receiving at the same time the rank of temporary captain in the Army.

ELLIOTT.—An inquest was held on July 5th on the body of Sec. Lt. Geoffrey Lionel Elliott, R.F.C., who was found dead in the wreckage of an aeroplane in a field at Adel, near Leeds.

No one appears to have seen the machine descend, and the pilot, who was stationed at a Yorkshire camp many miles from the scene of the mishap, had been dead many hours when discovered.

ERLEBACH.—Sec. Lt. Arthur Woodland Erlebach, R.F.C., who was killed in action on July 5th, was the third son of Mr. and Mrs. H. A. Erlebach, Woodford House School, Birchington. He was aged 23.

EYTON-LLOYD.—Sec. Lt. John Wathen Eyton-Lloyd R.F.C., was killed in action on June 24th, 1917. He was 22 years of age.

FAIR.—Sec. Lt. James Gerald Fair, Yeomanry, attached R.F.C. (reported missing on March 19th, now officially reported killed), was the elder son of Mr. and Mrs. James S. Fair, The Berks, Lytham, Lancashire. He was 19 years of age and had his commission in the Yeomanry in October, 1915; he was gazetted flying officer in Jan., 1917.

FLETCHER.—The Coroner's jury who inquired on July 7th into the circumstances connected with the fatal flying accident near Birmingham to Sec. Lt. L. M. Fletcher, of Newcastle-on-Tyne, warmly commended the gallant conduct of First Air Mechanic Merritt, who accompanied Mr. Fletcher, and who is at present in hospital suffering from injuries. The accident to the aeroplane is attributed to a faulty turn at 60 ft. from the ground, which made the machine drop to earth. Immediately it fell it burst into flames, and Major Nicholls said he saw Merritt run along the side of the machine and try to get the pilot out. Merritt was uninjured then, and got his burns in facing the fierce flames in a gallant attempt to rescue Mr. Fletcher.

Witness wished to emphasise the heroism of the act. Another witness stated that the machine blazed like an inferno. The medical evidence showed that Mr. Fletcher's skull was fractured, and a verdict of accidental death was returned.

[As the pilot was killed and the passenger uninjured, this looks like another R.E.8. accident, especially as the machine caught fire.—Ed.]

FOLLIT.—Lt. Reginald William Follit, R.F.C., reported missing on April 28th last, is now stated by his observer (a prisoner) to have died as the result of an aerial engagement. He was the younger son of Mr. William Follit, of Avenue House, Clapham Park, S.W., and was 26 years of age. Educated at St. Lawrence College, Ramsgate, he joined the H.A.C. before the war, and after the outbreak of war was granted a commission in the R.F.A. When in France he transferred to the R.F.C., acting as observer. He obtained his pilot's certificate in England, and returned to the front on April 18th last.

GRAY.—Sergt.-Pilot Louis Gray, R.F.C., who was killed in France on active service on June 7th, was the son of Mr. and Mrs. Lewis Gray, 73, Union Grove, Aberdeen. Sergt. Gray joined the Army upon the outbreak of war, and had seen a good deal of service abroad. When quite a young man he had taken an active interest in aviation, had constructed many models and a full-sized glider which was successfully flown at Duthie Park seven years ago. Sergt. Gray was only twenty-four years old.

HAIST.—At an inquest held on July 7th respecting the death of Sec. Lt. Orville Dwight Haist, attached R.F.C., a Canadian aged 23, who was killed in a flying accident at an East Anglian aerodrome, it was stated that he was an experienced aviator, having passed for his "Wings." He attempted to rise from the ground before flying speed had been attained, with the result that he "stalled" the machine. One wing fell, and the machine nose-dived to the ground. The officer died in hospital. A verdict of death from misadventure was returned.

HAMER.—Lt. Harold Hamer, R.F.C., who was reported missing on June 6th, and is now officially reported killed in action, was the fourth son of the late Mrs. Hamer, of Alistre, St. Annes-on-Sea. He was in his 26th year.

HAWKER.—Major L. G. Hawker, V.C., D.S.O., R.E., attd. R.F.C., who was officially reported missing in November, 1916, is now officially reported killed. For many months the R.F.C. has assumed his death, an assumption based chiefly on the complete absence of news concerning him, but confirmed by the fact that shortly after his disappearance a German in a front line trench shouted across to our infantry that a Flying Corps officer, wearing a V.C. and a D.S.O., had died of wounds in hospital at Cambrai a few days before. As Major Hawker was at the time the only R.F.C. officer holding both orders, the message evidently referred to him.

Lanoe George Hawker was born in December, 1890, and so was not quite 26 years of age. He was the second son of the late Lt. Henry Colley Hawker, R.N., and a grandson of the late Peter William Lanoe Hawker, of Longparish House, Hants. He passed out of Woolwich into the Sappers in July, 1911. In 1914 he joined the R.F.C., and was at the Central Flying School when war broke out. There he distinguished himself by his skill

(*Continued on page* 118.)

AERONAUTICAL ENGINEERING

SUPPLEMENT TO "THE AEROPLANE"

INCORPORATING AIRCRAFT ENGINEERING, AERODYNAMICS, AND MATTERS PERTAINING TO THE AERONAUTICAL ENGINEER AND THE AIRCRAFT TRADER

The British Aircraft Industry.

BY CHARLES L. FREESTON.

XXIII.—THE FAIREY AVIATION CO., LTD.

It is not too much to say of Mr. C. R. Fairey, the founder of the Fairey Aviation Co., Ltd., that he has achieved a record. As is well known by now, the manufacturers of British aircraft may be divided broadly into two classes—those who were already established as designers before the war, and those who, though normally engaged in some other business, have taken up aeroplane production since August, 1914, and, generally speaking, have worked to Government or other standard designs under contract.

A Unique Achievement.

In every way remarkable, therefore, is the fact that the Fairey Aviation Co., founded in July, 1915, though it did not come into active existence until 1916, or 18 months after the war began, has nevertheless earned a name for originality of design, and, apart from its own considerable output, already enjoys the distinction of having its machines made under licence by four other firms. The achievement is unique, and none the less so because it has not been brought about by any big capitalist backing, but solely by the energy, skill, and enterprise of one man—namely, Mr. C. R. Fairey himself; and in the circumstances he may reasonably be described as one of the most brilliant young men of the aircraft industry

Mr. C. R. Fairey.

Mr. F. G. T. Dawson.

Natural Stability Models.

As will naturally be inferred, however, Mr. Fairey was no stranger to aircraft production when he established the firm which bears his own name, and as a matter of fact, his previous experience was extensive and gained in a good school. An electrical engineer by profession, and a first-class honours man at the City and Guilds, he also qualified in chemistry, and for a time was a lecturer on science at various polytechnics.

Aviation, however, had attracted his interest from the first, and he made a close study of the theories of inherent stability, and was a diligent experimenter with models. His first success in this direction was produced when he was twenty-two years of age, and though he had designed it in the interests of science alone, it was pointed out to him that the model would make a most excellent toy. Accordingly he disposed of his rights therein to Mr. A. W. Gamage, and a large number were made and sold, to the delectation and edification of the rising generation. Mr. Fairey also built a machine for the "Daily Mail" Model Competition, but it was smashed before the date of entry.

The Dunne Machine.

A long illness kept him out of aviation matters for some time, but after his recovery he got into touch, through the introduction of Major Baden-Powell, then President of the Aeronautical Society, with Lieut. (now Capt.) J. W. Dunne, the inventor of the famous inherently stable aeroplane, who had set up a workshop at Eastchurch.

The Blair Atholl Syndicate, it will be recollected by all who have followed the course of aviation development from the first, had been working out Mr. Dunne's ideas for years at Glen Tilt, in Scotland, under the fostering encouragement of the Marquess of Tullibardine, now Duke of Atholl and President of the Royal Aero Club. The venue was ultimately changed to Leysdown, however, and thence to Eastchurch. Mr. Fairey joined the Syndicate as manager and chief engineer.

A Problem in Stressing.

Four Dunne machines were built under Mr. Fairey's supervision at Eastchurch, the first being fitted with a 60-h.p. Green motor, while the 80-h.p. Gnôme was employed in the remaining three. The essentially individualistic design of the Dunne biplane, with its set-back staggered planes, gave Mr. Fairey a very pretty problem to tackle in the way of stressing, but he undoubtedly solved it with success.

The first two machines were regarded as experimental, while the second pair were constructed to the order of the War Office as the outcome of the extraordinary results attained by the earlier pair.

Convincing Tests.

The justification of Lieut. Dunne's ideas was complete, and a more naturally stable machine was never built. It is a fact that in the course of a single afternoon five persons flew the Dunne biplane, three of whom had never flown a machine of any type before.

A further interesting fact that may be adduced in this connection is that a one-armed man qualified for his pilot's certificate on the 60-h.p. Dunne—namely, Captain (now Colonel) A. B. Carden, R.E. This was the more remarkable from the fact that the Dunne machine has no foot control, notwithstanding which the ordinary hand controls were in no way altered for Capt. Carden's benefit.

A Cross-Channel Flight.

The crowning achievement, however, to the credit of the Dunne machine was its cross-Channel flight in 1913 with the 80-h.p. Gnôme. This was the second of the two experimental machines, and it was flown by a Frenchman, Captain Felix.

The general public, by the way, might have had much more expansive ideas as to the possibilities of flight if a few thousand Dunne biplanes could have been exhibited in various parts of the country in the hands of demonstrators who knew how to captivate the crowd; Captain Felix, on his part, used to stand up on one of the wings while he was doing a spiral *vol plané*, and his particular group of spectators, of course, were duly impressed.

That the Dunne machine has not ranked as a commercial proposition is due to a variety of causes, chief among which was the continued ill-health of the inventor himself. Of his genius, however, and the courage with which he embarked upon the construction of machines of such unconventional design, Mr. Fairey himself speaks with the greatest respect, and, though he doubts whether the Dunne would now hold its own for war purposes, he is convinced that if it had ever had the backing which the three-rudder types received, it would have occupied a much more prominent position in aviation history. It may be added, by the way, that certain machines are still made in America under licence to Dunne.

In 1913 Mr. Fairey went to Messrs. Short Brothers as chief engineer, at the period when they had begun the production of their well-known 160-h.p. seaplanes. He remained at the Eastchurch works for a considerable time, and then transferred his services to the Rochester establishment of the same firm.

A Bold Departure.

Meanwhile, however, he had decided to launch out for himself, and eventually founded the Fairey Aviation Co., Ltd., of which he is at once the chairman, managing director, and chief shareholder, his co-directors being Flight Lieut. F. G. T. Dawson and Mr. Charles Crisp.

The way in which operations were begun in February, 1916, almost savours of the romantic. A factory was acquired at Hayes, Middlesex, which had belonged to the well-known firm of motor-carriage builders, Messrs. van den Plas, and at the time of the transference the works were engaged upon motor lorries.

Of the three hundred Belgians employed, not one knew anything whatever about aeroplane construction or production in any particular, nor was there a single skilled draughtsman on the premises, whereas now there is a technical staff of thirty people. Mr. Fairey accordingly had to train his own draughtsmen and foremen, install a new plant, and, in addition to his triple commercial responsibilities, as above defined, was also his own works' manager, and, above all, his own designer.

Unparalleled Progress.

Nevertheless, the progress of the firm has been one of unparalleled and all but meteoric rapidity. As an organiser alone Mr. Fairey's efforts might have been accounted more than remarkable, and the more especially as his partner, Flight Lieut. Dawson, was away in the Dardanelles, but they are even outshadowed by the part Mr. Fairey has played in the realm of design.

From the outset he addressed himself to the task of developing big seaplanes on new lines, and chiefly in respect of the problem of a variable lift, which he has solved with marked success.

Successful Designs.

To keep the works going while he was completing his designs Mr. Fairey accepted a contract for the construction of a large number of land machines of a very well-known type.

The moment, however, his own ideas had been reduced to practicable shape, he set to work to build variable lift seaplanes, and of these he has produced no fewer than four separate models. Their success has been emphatic, and they are not only being turned out for the Admiralty by the Fairey Aviation Co. itself, but also, as already stated, are being manufactured under licence.

Thus we see that in the space of little over a year Mr. Fairey has not only founded and made a commercial success of a new concern, but has also placed himself in the position of being able to decline all contract work on established designs, and to take the lead with a new line of original types. It is almost needless to remark that a great deal more would have been heard about the Fairey machines as such but for the fact that they have been evolved since the war began.

Constant Expansions.

The works at Hayes have been very considerably expanded since they were taken over from the van den Plas Company, and further enlargements are still in progress. They afford evidence on every hand, as a tour of the premises discloses, of a sound knowledge of everything that is required in the way of organisation and plant for the production of machines of the best and latest types, and, taken altogether, may be regarded as a unique development.

Mr. Fairey has just been joined, by the way, by Mr. Charles, late of the Sunbeam and Daimler companies, who will henceforth act as general manager at Hayes. It must also be mentioned that, in addition to the premises at Hayes, there are also an erecting shop and experimental station at Hamble, under the charge of the second director of the Fairey Aviation Co., Mr. Dawson, who has been invalided out of the R.N.A.S. Incidentally one must note that Mr. Dawson is himself quite a pioneer of aviation, having taken part with Mr. (now Wing Commander) Ogilvie, Mr. (now Flight Commander) Maurice Wright, and Mr. (now Squad. Comm. and D.S.C.) Vincent Nicholl, in gliding experiments at Eastchurch somewhere about 1911. On the outbreak of war he left Cambridge, along with Messrs. Wright and Nicholl, and joined the R.N.A.S., learning to fly at Eastbourne under Mr. (now Squadron Commander) Bernard Fowler, and soon became a first-class pilot.

He saw much service in the Eastern Mediterranean, and was invalided out of the Service owing to serious heart trouble, which prevented him from flying to any great height. He still flies as skilfully as ever, but has to exercise considerable restraint over his natural inclination to do those things with his machine of which he is capable. As a practical pilot of long experience he is in every way qualified, of course, to supervise the testing of the Fairey seaplanes and the experimental work generally which is carried on at the southern station.

AND YET ANOTHER.

It is the custom of minor public prints to refer to their rival contemporaries as "rags." The term is usually mutual, although the proprietors do not append it to their own property. It is therefore the more entertaining to inspect the first numbers of a self-confessed "rag." The Aircraft Manufacturing Co., Ltd., has long been noted for its enterprise, and one therefore has expected the production of a house magazine for some time. The excellence of the first two issues seems to explain that the moving spirits waited till it was possible to start under the most auspicious conditions, and certainly the right note has been struck at the first attempt.

The "Aircraft Rag" is the magazine of the employees of the firm, and as it only comes out once a month, there is time for work of a high order to be produced.

The June issue includes an admittedly humorous section called "Bottles and Rags," by the "Ragpicker," which contains a fund of amusing quips, relevant and irrelevant to aircraft.

"Gladys" gives some advice to her own sex only upon the art of getting joy-rides, the soundness of which is queried by the statement that the illustrations are by the author, who signs them as Alan Hill-Reid!

The illustrations are of a very high order, and include a full-page picture of the King and Queen inspecting the Aircraft Manufacturing Co.'s works, by Mr. J. K. Baughan; humorous pictures by Mr. G. Stredwick, "The Junior Clerk," Mr. Alan Hill-Reid, and others, and a very fine picture of the woodcut type by one signed "P."

The text includes "The History of the Bolt Inspection Department," an interview with the Chief Sprinkler, an "Ode to a Turnbuckle," a serial article called "Tee-Square Bill," and a great deal more, all of which combines to make a very good pennyworth.

GERMAN INDUSTRIAL NOTES.

The A.E.G. Aircraft Works announce the death of their chief pilot, Theodor Schauenburg, who was one of the oldest German pilots. Another early aviator, former Grade pilot, now Sub-Officer Carl Abelmann, is missing since a patrol flight

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The "Automobol and Aviatik Co., Ltd.," has formed branch works at the Bork aerodrome by Berlin, formerly owned by the Grade Aeroplane Company.

* * *

The "Bavarian Aircraft Works," which were formed in 1916 with a capital of £500,000 by the partaking of the Augsburg-Nürnberg Submarine Engine Works, has earned in the first business year net profits amounting to £67,772, of which 20 per cent. were paid as dividends, and £55,000 set aside for war excess profit tax. The advance part payment by the army authorities for aeroplanes to be delivered later amounted to £75,000.

Through Enemy Eyes.

(A LESSON FOR THE BRITISH AUTHORITIES).

BY "THE AEROPLANE'S" DANISH CORRESPONDENT.

Following are some extracts of the reports and reviews in the German aeronautical Press, of the German Aeronautical War Trophy Exhibition. The praise may be taken for genuine, as it comes from the enemy. In "Motor," Berlin, Engineer John Rosendaal writes :—

"The huge development of the whole aviation in this world's war, together with the associated refinement of the detail work of all planes and instruments is last, not least, the result of the continuous, though involuntary, exchange of thoughts by means of war trophies, as regards the technical aids available for the extraordinary fighting taking place. This exchange develops a mutual fructification of ideas, which should in other times likely not be possible to such a degree.

"From the moment that the product leaves the home works to be engaged in the fight against the enemy on some point of the front its eventual loss and the unveiling of its design must be reckoned with. This invariable fact forces all parties uninterruptedly to strive at the perfection of their weapons not to experience the danger of being beaten with their own weapons.

"This general state of conditions has, of course, foremost validity in such a young weapon as the aeroplane, so, quite apart from other motives, it is a thought highly to be welcomed that the Commanders of the Air Services have offered the designers and experts a chance of getting an idea of the standing and development of aviation by the enemy, through the concentration of the booty in the one place of the Delka (the initials standing for: Deutsche Luft Kriegsbrute Ausstellung—or German Aeronautical War Trophy Exhibition). And, to say it at once, if you distinguish between men and machines, the show is more than remunerative."

Engineer Rosendaal deserves the praise of possessing rare objectiveness for a German. Also the well-known German aeronautical engineer, Mr. Roland Eisenlohr, writes in "Deutsche Luftfahrer Zeitung" (German Airmen's Paper), and "Der Motorwagen" (The Motor Car), as follows :—

"No one can doubt that we are far superior in German aviation with design—with the one exception of the Nieuport biplane to be considered a special brilliant French achievement—in quality of the construction, in scientific shape of the planes, etc.

"Another question is that of working out the single parts as to quantity manufacture, which rules undisputedly more among the enemy. An instance being the employment of double wires, not as a factor of safety, as the one would seldom stand the strain when the other has been shot through, but for simplifying the erection, as different sizes and turnbuckles are thus done away with. When one wire suffices no more for the average strain they employ two, though they are combined really too strong. But then they have in the whole aeroplane only one turnbuckle model, one size of stamping sheet, holes and pins. The stampings themselves can be manufactured much quicker in quantities by better utilisation of machine work. However, quality is regarded more by us than quantity, which is the reason that such efforts are very rare in Germany, and rendered almost impossible by the specifications.

[British aeronautical engineers who have been crying for years for simplification of standards by means of reducing the foolishly large number of different sizes of everything in our Government designed machines will weep with joy over this remark. But, possibly, Herr Eisenlohr's remarks apply to the Nieuport only, and not to Allies' machines in general, including B.Es, R.Es, and F.Es.—Ed.].

"The wooden work is another matter. In the otherwise very scientific construction of the Sopwith biplanes the longerons of the body are cut out for their whole length without any regards to the stampings, which are, on the other hand, made so that they do not perforate or weaken the longeron. What is not the saving in work and weight, too, by such a procedure? Perhaps it would be better for us to enter upon this idea, too, as workmen are not too plentiful in our aircraft industry.

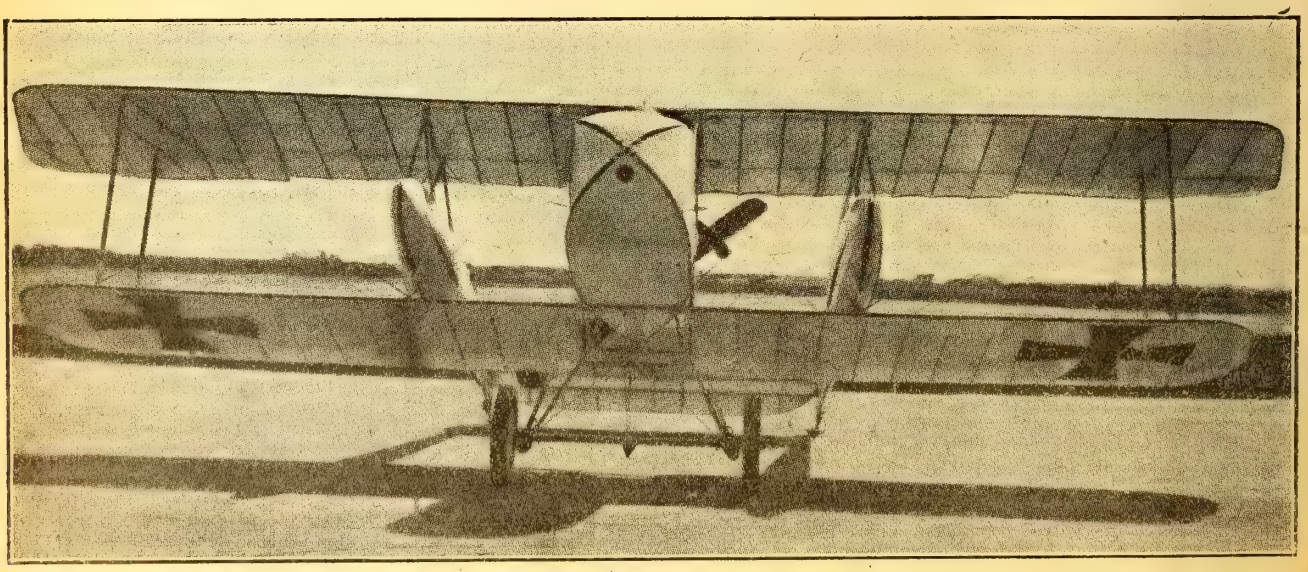
"No doubt the most interesting aeroplane of the whole exhibition is the two-seated Sopwith biplane, representing the summit in the English aircraft trade, though it cannot show the excellent workmanship of German products.

[This will please Mr. Sigrist.—Ed.]

"It was highly to be appreciated that the planes of the Sopwith were shown uncovered, as the object of the exhibition was not only to keep the interest of the public alive in the Air Services, but to give the designers impulses by studying the products of the enemy, to which end the Sopwith offered many inspirations. The body is as genuine as the work of the planes, in the effort to do away with all unnecessary weights. (See the remarks on carving, above.)

"Even in this otherwise well-designed biplane the wires for the elevator and rudder are exterior. The Sopwith biplane is especially extraordinary for two peculiarities of design; first, the ailerons on the lower plane, which can be pulled up and likely serve to reduce the landing speed, as well as to regulate the speed in flight. Second, as the biplane is likely used also for bombing purposes without the observer, the stabilising plane (or tail plane) in front of the elevator can be moved by the pilot. While the front bearing point is placed in a hinge, the back point, through which the vertical steel tube passes, also carrying the vertical fin, can by means of a worm be screwed up and down, a construction belonging to the best produced to this effect. It would take us too long to deal in detail with the many other interesting points.

"Of the three hydro-aeroplanes exhibited one is a seaplane, and moreover specified as a Sopwith fighting single-seater, the machine-gun of which was not mounted, it is to be regretted. It is the best British seaplane type among the single-seaters, and shows a very good construction, like the before-described Sopwith biplane. The sturdy body with the pleasant cowling of the rotary engine lends the aeroplane a good appearance. Not to have to demount the floats for railway transport the back part of the body is made detachable, whereby turnbuckles are very simply used as a fixing, as shown in an accompanying sketch. The front stamping is not even carried out as an eye, but only shaped like a hook. But then the fixing lying pretty far backwards has not to stand very high strains. Yet such a device should be quite untolerated in Germany."



The Small High-Speed A.G.O. Pusher, commonly known as "Two-tails." The two fuselage-like tail-booms are evidently a praiseworthy attempt to do away with the clumsy and weak tube booms and wires of the ordinary pusher type and thus reduce head-resistance and increase strength at the same time.

Mr. Rosendaal remarks on it: "A daring but practical connection of the two body parts by means of four turnbuckles."

Of the "Avro," Mr. Rosendaal writes: "A biplane with the general known tractor body, and one of the owners of the firm, Mr. A. V. Roe, was, indeed, one of the pioneers of the now usual tractor biplane with the motor and propeller in front, as he built already in 1908 a three-plane with tractor body, on which he carried out successful flights.

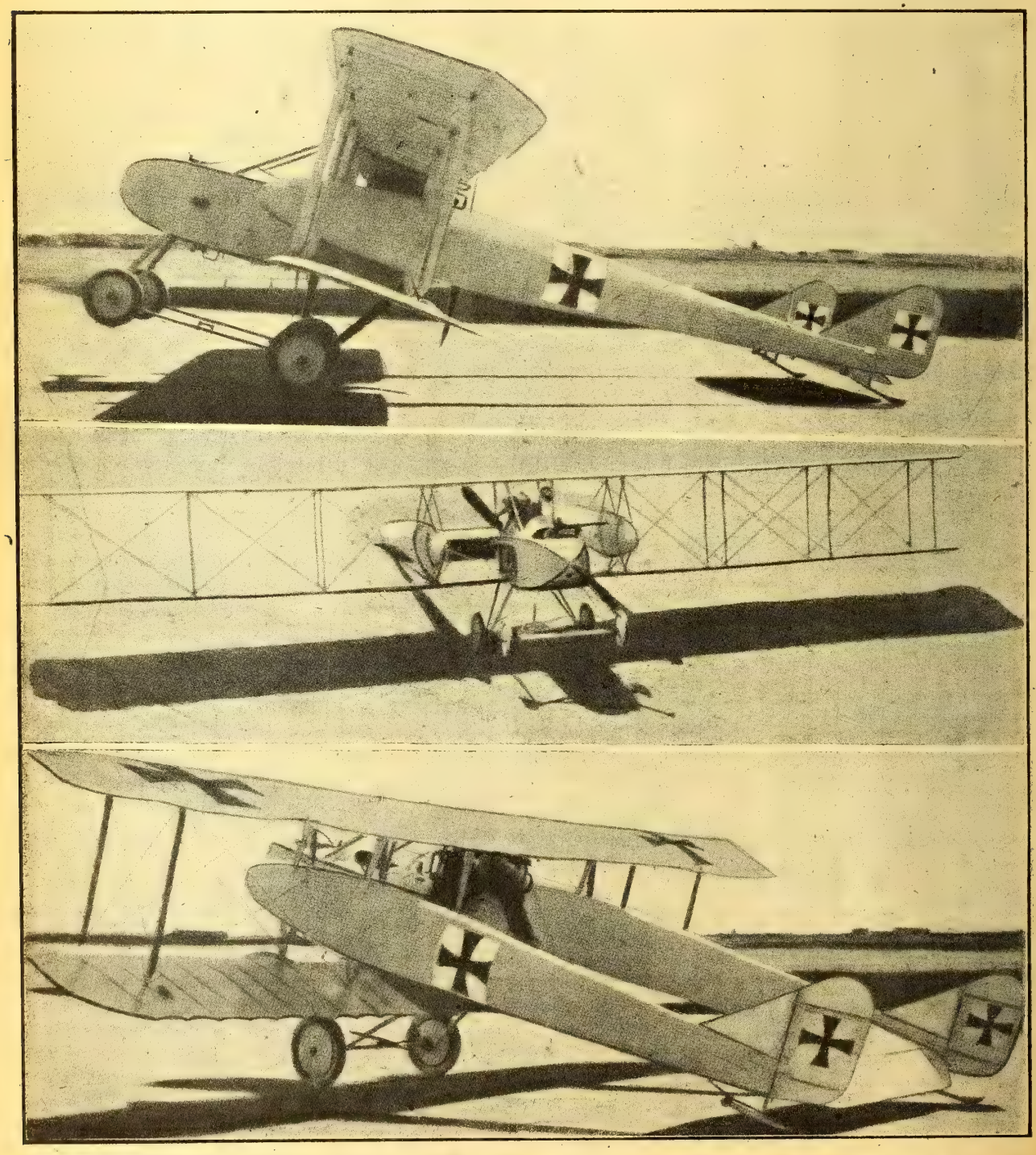
"The here-exhibited two-seated biplane astounds by its slender shape and pleasant lines, but must else for the rest, concerning measures and distribution of the weight be considered as antiquated since a long time. Roe belongs to the designers who recognised at an early date the high value of streamlines and good plane shapes, and acted thereupon in practice."

Continuing, he writes: "Behind the Nieuport the single-seated Martinsyde is to be seen, being, too, very good work. A part of the linen cover of the lower plane is taken away, affording a view into the interior design. One notices very sound work. All wooden parts are enamelled (varnished) as protection against the atmospheric influences, a practice that has disappeared much during later years, yet is fully justified. One would prefer to see square longerons instead of the 'I' ones."

Engineer Eisenlohr continues: "It was intended to exhibit the Handley Page giant biplane, but perhaps it is well that this aeroplane was not to be seen, as it looks too impressive, and, perhaps, easy had drawn an unfavourable opinion of the German aeroplanes from the laity, who do not know the German opposites. It would not satisfy German claims in design and performance, though the total arrangement offers, no doubt, the expert much of interest by close study.

"It is a pity that a chance could not be given of comparing these exhibited hostile aeroplanes with the German equals; for first, then, the difference between our and the enemy's design and construction should become evident. For it is proved facts that our enemies cannot approach our workmanship in quality, but be it confessed that their aeroplanes often are superior to ours, partly from lacking factor of safety, and partly from insufficient construction, exposing the passengers to danger of life.

"For the Frenchman and Englishman attains only the lightness of his machine through savings in weight in some of the



Above and in the middle, side and front views of the big A.G.O. Pusher, and below, three-quarter rear view of the little one

most dangerous places, and thereto the solid German industry cannot be induced. The opinion of the twin-engined Caudron biplane is that its construction should have been condemned years ago, but beside showing how not to do it, it lends itself to the question whether is not another way beyond the one ordered in Germany for construction to get active serviceable aeroplane types. For, undoubtedly, our enemies do not, by all means, build light twin-engined aeroplanes without some reason."

German papers pay the new Spad scout especial attention and exceptional praise; thus "Flugsport" has a special blue-paper cross-reference to its description of the Spad biplane, and the "German Airmen's Paper" ("Deutsche Luftfahrer Zeitschrift") writes in extract to this effect:—

"In a way worthy of being taken for a model the motor is enclosed completely, disappearing in the exemplary formed body. So one has to pronounce and recognise this new construction in the field of single-seater scouts as very excellently designed, throwing all former results of our enemies far in the shadow, especially owing to the exceptional large attention to rigid solidness of the whole structure. The German aircraft industry shall learn much from this aeroplane type and become incited to many new ideas in design. Just as our enemies equipped last year in the big Spring offensive an exceptional number of their Air Service with the Nieuport biplane, so they did this year with the Spad scout. Our aircraft industry have too worked during the winter on new types that shall, be it hoped, get an equal recognition to that which we cannot refuse this aeroplane."

The capture, or more correctly, the errorial acquirement of a Handley Page giant biplane near Laon was given a widespread publication in the German Press, but apparently with somewhat unexpected effect. For it has evidently been a general impression in uninitiated circles of Germany, that in this field of aerial activities with big aircraft she had been surpassed.

As experts warn expressly not to get that belief, the suppressing from national interests of doings in this line declaring alone the lack of information concerning German twin-engined battleplanes, careful observers will explain the permission of German aero papers to illustrate the Ago, A.E.G., and Gotha double-engined aircraft also as an effort to counteract any such impression, and now, again, the new German aviation weekly paper "Luftwaffe" (The Air Force), being the catalogue of the German Aviation War Trophy Exhibition prints the four illustrations of Ago battleplanes, rendered here.

They represent two various models, varying chiefly in wing spread. Both biplanes are twin-bodied pushers with Farman type nacelles. The smaller one does apparently not exceed the wing span of a normal-sized tractor biplane, and has but one set of struts to each side beyond the two oval ones, carrying the bodies, the chief object of which seem to yield that pusher type a better longitudinal stability than afford the general Farman strut tails, for they carry no engines or passengers, and are apparently made of two parts, with a black lining as visible. The struts are combined by single wire crosses, the nacelle is supported by two inclined struts from the leading edge of the upper plane to the middle of the nacelle, between the two seats, and the tail skids end with the metal scoops, first applied to the middle skid of the Nieuport monoplane.

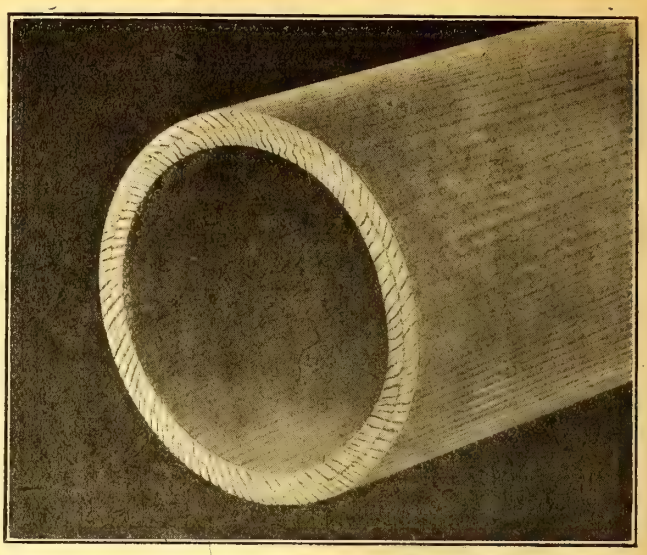
The second Ago twin-bodied battleplane is identical in design and construction, and apparently in the size of the various parts even, but for the larger wings, apparently doubled in span, with three sets of struts to each side, and the four-wheel landing chassis of Voisin type.

[One imagines that the real reason for the two so-called "bodies" is the theory that two good stout streamlined built-up tubes will be less vulnerable, and will offer less head-resistance than four thin tailbooms with the usual network of wires. The idea seems quite sound, and, properly carried out, it might produce the much-desired high-speed "pusher" biplane, especially in large sizes, where one could fit an enormous engine.—Ed.]

CONCERNING HOLLOW SPARS.

Some time ago reference was made in these columns to the McGruer Hollow Spar, which has been proved to give enormous strength for its weight. At that time it was not considered advisable to illustrate the method of the construction of the spar, but as it has now become commonly known and has been illustrated in various quarters, there can be no harm in drawing attention to the general idea of the construction, without giving away details. The accompanying picture shows the idea roughly.

The wood to be made into a spar is cut as a flat sheet with the grain of the timber vertical. It is then bent over by a special process, the secret of which belongs to the firm, and is formed into a tube, which tube may be either a circular section as shown, or may be multi-sided, oval, or streamlined. Outside the first tube a second tube is formed, which is cemented in a special manner to the inner tube, and thus one arrives at what is practically a 2-ply tube, which, owing to the method of construction and the material employed in jointing, is astonishingly



The General Idea of a McGruer Hollow Spar.

strong for its weight, as well as retaining the elastic properties of the wood itself.

It has taken a very considerable time for some people in the Services and the Aircraft Industry to recognise the merits of this particular method of construction, but one now hears that it is being vigorously taken up by many firms, not only in the Aircraft Industry, but in a number of other trades where wood spars are largely used.

One of the chief advantages of the McGruer bentwood hollow spar system is that not only does it give extraordinary strength for weight, but it actually results in an enormous saving of timber, because it is possible in this way to make a hollow spar out of thin sheets of timber instead of by hollowing out large chunks, thus wasting all the material removed in the hollowing.

The address of the McGruer Bentwood Hollow Spar Company is Commercial Wharf, Lambeth, S.E., and the firm will be very pleased to negotiate with any aircraft manufacturer who would like to investigate the possibilities of the system for any special section of strut, spar, or boom in his own designs.

FOR METAL PARTS.

Some time ago it was noted that Mr. Wilson, who has had considerable experience in the cycle, motor car, and aircraft industries, had started as a manufacturer of aircraft parts at Kingston under the title of the Swift Aviation Company, and as soon as it was in working order the firm found itself well supplied with work, and quickly began to earn a good reputation.

Not long afterwards, Mr. Wilson was joined by Mr. E. C. Gillett, himself an engineer of very considerable experience. With Mr. Gillett's able assistance the output has increased steadily, and the firm is now in a position to supply parts for any type of aircraft at short notice, for either Mr. Wilson or Mr. Gillett is almost continuously at the works himself, so that inquiries are dealt with promptly, owing to the principals of the firm being on the spot and being practical men.

PREMISES WANTED.

Barimar Ltd., scientific welding engineers and sheet metal workers, 10, Poland Street, Oxford Street, London. W., would be glad if any of our readers who are property owners, lessees, or agents, who have to let in Central London factory premises, with offices, warehouses, with yard, facilities for extension, and back or flank entrances, would communicate with them.

AN OPPORTUNITY.

A British engineer in London with capital and a live business organisation writes to say that in view of the extreme need for the rapid development of our Aircraft Service he is prepared to co-operate financially and actively with any good firm and accept a seat on the board of management. If any readers know of the existence of such an opening and will write to the Editor of this journal, business may result.

THE NEW BUYERS' GUIDE.

In response to numerous inquiries, one is able to state with emphasis that there is no truth in the rumour that the proprietors of THE AEROPLANE intend to apply for a positive Patent for the protection of this piece of platitudinous profundity from the piratical propensities of peculative Prussians, nor is it intended to invoke the wrath of the Paper Commission by "featuring" this admittedly useful institution in a weekly twenty-page supplement with deckle edges.

At the same time, the advertisement manager will welcome any suggestions as to how the comprehensiveness and general usefulness of the Buyers' Guide may be enhanced.

The Production of Aeroplanes and their Components

(Fifth Instalment.)

BY STEPNEY BLAKENEY.

The Top Half.

Having now completed the bottom portion of the rear end of the fuselage, it is necessary to commence on the top portion, which, being similar to the bottom, can be built in a similar manner, with the difference that as the lower portion is not parallel to the top longeron, the distances of the struts apart will be slightly longer in the low portion, and it will for this reason be necessary to refer to the plan and see if the existing jig can be utilised.

Otherwise a new jig will have to be prepared on similar lines.

Assuming that the top and bottom portions of the rear end of the fuselage have been built, the next question to consider is, how is the fuselage to be completed, with its side struts to put in, and all the swaged wires to be fixed and adjusted?

Erecting the Fuselage.

To enable this to be done easily it will be advisable to consider making a simple jig, which will simplify erection tremendously, and enable the work to proceed rapidly, and tend to prevent mistakes. For this purpose, make six portable columns standing on feet, with adjustable top and bottom, cross rails and longitudinals (see Figs. 10 and 10a). The use of this jig will enable work to be put in hand quickly, and when completed taken down. Reference to Fig. 10 will give an idea of its construction.

Having completed the jig, the first thing to do will be to take the top rear portion of the fuselage, and attach it to the top portion of the jig on the underside of the cross bearers as shown, and then put the bottom portion of the fuselage on the top of the lower cross bearers as shown. After which, level up the top portion of the jig with a spirit level, and then adjust the lower portion to the inclination given by the measurements of the lengths of the struts between the longerons.

After this is done and carefully checked, the struts with their fittings on them may be put in their respective positions and bolted to the longerons and riveted up, and the ash skid post fixed. Then the only work remaining to be done is to put in the tie rods and fork ends with lock nuts, and to adjust the tension on them.

Then the lower longitudinal and cross bearers can be lowered slightly, and any adjustment necessary in the tie rods will be at once seen while the rear portion of the fuselage is in suspension and the "line of flight" of the machine is in a true and horizontal position. In this manner the necessary truing up of the fuselage can be done.

The Front Section.

The front portions of the fuselage can now be constructed. They will have to be constructed in a jig similar in design to the rear portions, only these parts will be left- and right-handed, instead of top and bottom. Extreme accuracy will be necessary in all measurements, especially in the distance between the top longerons and the bottom ash spars, otherwise it will be impossible to join these front portions, when made, to the rear portions, already finished, as the joint of the longerons is a plain butt-joint, with cover-plates of steel top and bottom, like fish-plates.

A jig will have to be made for the left hand and also the right hand, as the outsides are covered with three-ply wood, on one side only, namely, the outside, being attached to the longeron,

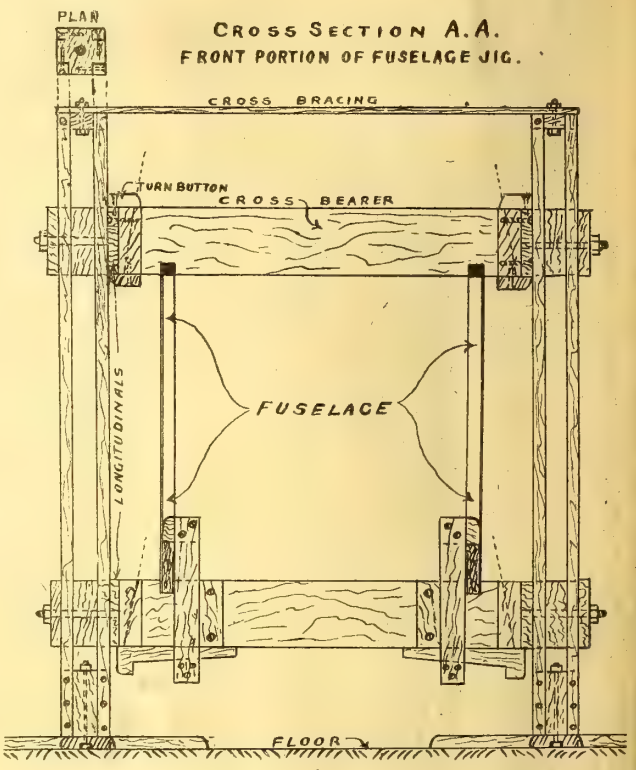


FIG. 10a.

engine bearers, cross bracing (which is of wood), and ash spars with small screws.

Assuming that the front portions of the fuselage are completed, and passed by the A.I.D. Inspector, they will be taken to the erecting shop. To put them in the jig, the bottom stop and the longitudinal sides of the jig may have to be lowered slightly to enable them to slide into the slots made to hold them in the cross bearers. After they are in position, the tapered wedges will be driven home. This will clamp them firmly to the bottom cross bearers (see Fig. 10a), other adjustments being made that are necessary.

Checking for Alignment.

These having been completed, it will be necessary to try the whole jig with a spirit level, and fine 22 gauge steel wire stretched along the top and bottom centres, between the longerons, from end to end. Test them both, for vertical alignment, about every 2 ft., by means of a plumb-bob line, from the top wire to the bottom wire, taking extreme care to see that the plumb line from the top wire touches the bottom wire at each point tried in the same side. This should be done in the presence of the foreman erector, unless two skilled mechanics are available.

SECTIONAL ELEVATION OF JIG AND FUSELAGE.

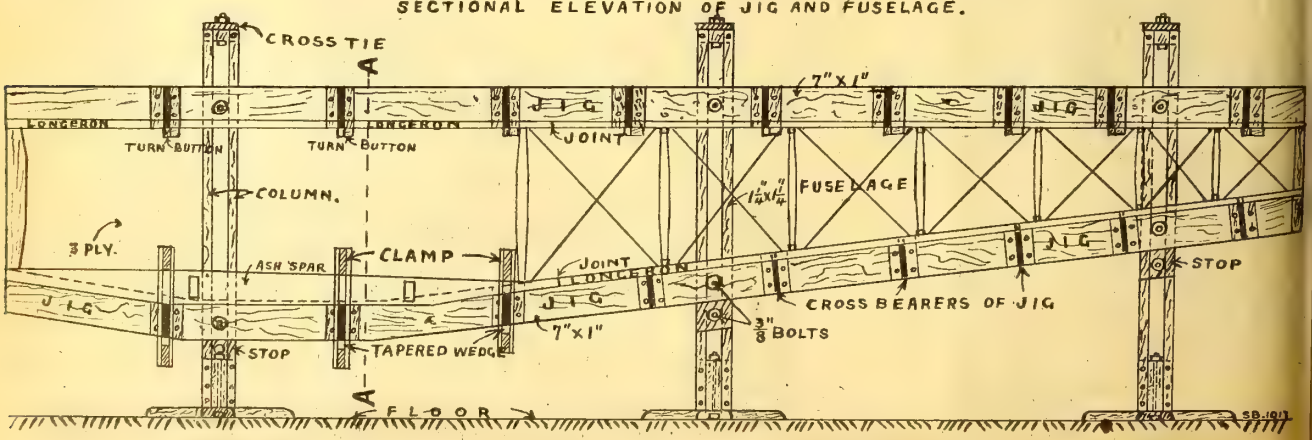
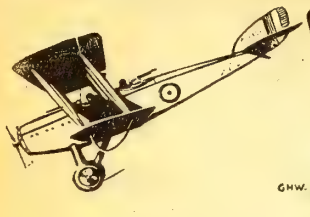


FIG. 10.



The Aeroplane

Acetylene Welding Plant—

Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—

Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180.
Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation, Newcastle-on-Tyne."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich 851. "Aviation, Norwich."
British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."
British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."
Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.
Curtiss Aeroplane Co., L. J. Seely, Clun House, Surrey Street, Strand, W.C.2. City 7724.
Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.
Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."
Grahame-White Aviation Co., Ltd., London Aerodrome. Kingsbury 120.
Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."
Mann, Egerton & Co., Aircraft Works, Norwich.
Martinsyde, Ltd., Brooklands, Byfleet. Woking 331; Byfleet 171. "Martinsyde, Weybridge."
National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.
"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455. "Nieuscout, Crickle, London."
Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."
Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."
Sage, F., & Co., Ltd., Peterborough.
Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."
Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Victoria 3673.
Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."
Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."
Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerfyta, Knights, London."
Waring & Gillow, Ltd., Hammersmith. Museum 5099. "Warisen, Ox, London."
Westland Aircraft Works, Yeovil.
White, J. Samuel, & Co., Ltd. East Cowes. Cowes 3. "White, East Cowes."

Airships—

Airships, Ltd., High Street, Merton. Wimbledon 1314.
Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, 'Phone, London."

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."
Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3.
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Aluminium Presswork (Stampings, Etc.)—

Annealing Furnaces—

Fletcher, Russell & Co., Ltd., 15, Fisher Street, Southampton Row, W.C.1. Holborn 5116-7.

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Brass Sheets for Tipping Propellers—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Buildings—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Bizfibild, London."
Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.
The Wilfley Co., Ltd., Salisbury House, London Wall, E.C.2. City 2681-2. "Wrathless, Phone, London."

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3.

Castings (Aluminium)—

Coan, R.W., 2190, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon Dope—

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."
London Label Co., Becton Road, Becton, E. East 1300.

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.
Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend."
Hazel & Co., 4, Princes Street, Hanover Square, W.1.
Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1970.

Component Parts—

Accles & Pollock, Ltd. Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."
B. D. V. Aircraft Spares, Syon Chambers, 16a, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."
Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.
The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—

British Aeroplane Varnish Co., Ltd., Milburn House, Newcastle-on-Tyne, and 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."
British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."
Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."
Clarke, Robert, Ingham & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Elastic Cords—

Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electric Cables—

E. Kalker & Co., Coventry. Coventry 242. "Kalker, Coventry."

Electrical Accessories—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford No 1. "Fump, Bedford."
Arrol-Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
Beatty School of Flying, Ltd.
Beardmore Aero Eng., Ltd., 112, Great Portland Street. Gerrard 238 "Beardmore London."
Dudbridge Iron Works, Ltd. (Salmson), 87 Victoria Street, London, S.W.1. Vic. 7026 "Aeroflight, Vic., London."
Gordon Watney & Co., Ltd., Weybridge Weybridge 550 (7 lines). "Mercédès, Weybridge."
Green Engine Co., Ltd., Twickenham Richmond 1293.
Gwynnes, Ltd., Hammersmith Iron Works Hammersmith, W. Hammersmith 1910 "Gwynne, Hammersmith."
Sturtevant Motor Co., Hyde Park, Boston U.S.A.
Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Moorfield Wolverhampton."
The Gnôme & Le Rhône Engine Co., Ltd 47, Victoria Street, S.W.. Walthamsto 408 (2 lines). "Eleverfodd, London."
Willans & Robinson, Ltd., Victoria Work Rugby. Rugby 112 (3 lines). "Willan Rugby."

Flying Schools—

Bournemouth Aviation Co., Ltd., Talbot V lage, Bournemouth. Bournemouth 11 "Etches, Winton."

Galvanising—

Boulton & Paul, Ltd., Rose Lane Works, N wich. Norwich 851. "Aviation, Norwich
Cowper-Coles Manufacturing Co., Sunbu on-Thames. Sunbury

Gears—

Moss Gear Co., Ltd., Thomas Street, Ast Birmingham. East 407. "Mosgear, Bir ingham."

Glue—

Adams & Co., Ltd., West Bromwich. Bro wich 264. "Reliance, West Bromwich
Improved Liquid Glues Co., Ltd., Gt. Herr tage Street. Croid. Avenue 31
Mendine Co., 8, Arthur Street, E.C. Bank 58

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albema Street, Piccadilly, W.1. Regent 13 "Shatterlys, Piccy, London."

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, Lo Acre, W.C. Gerrard 1077 (3 line "Comyn, Ching, Westcent, London."
Chas. P. Kinnell & Co., Ltd., 65 & 6 Southwark Street, London, S.E.1. H 372 (2 lines). "Kinnell, London."

Instruments—

British Wright Co., Ltd., 33, Chancery La W.C.2. Holborn 13

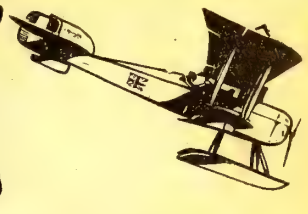
Machine Tools—

Bliss, E. W., Co., 2a, Pocock Street, Bla friars Road, London, S.E.1. Hop 43 "Blissdon, London."
Brewster & Co., 11, Queen Victoria Str E.C. City 768. "Circumfuse, Cann London."

Magnetos—

The M-L Magneto Syndicate, Ltd., Victo Works, Coventry. 1908-1009 Coven "Corlton, Coventry."

Buyers' Guide.



etal Manufacturers—

Chas. Clifford & Sons, Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

etal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."

Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."

Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2297.

Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041. "Bayliss. Wolverhampton."

The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Foster Engineering Co., Wimbledon. Wimbledon 1800 (3 lines). "Fosteraco, London."

Mann, Egerton & Co., Ltd., Aircraft Works, Norwich. Norwich 482. "Motors, Norwich."

Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261. "Fremo, Birmingham."

Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."

Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."

Selsdon Engineering Co., Ltd., Croydon. Croydon 1761-123. "Selig, Cent, London."

Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

etals in General—

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3.

etric Bolts—

Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

scellaneous—

Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."

Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C.

Bowdon Wire, Ltd., Willesden Junction. Willesden 2400 (3 lines). "Bowirelim, Harles, London."

Brown Bros., Ltd., Great Eastern Street, E.C.1. London Wall 6300. "Imbrowned, Bethroad, London."

Edison Swan Electric Co., Ponder's End. (Lamps.)

Herbert Frood Co., Ltd., Chapel-en-le-Frith. Central 793. "Frodobrake, Birmingham."

Glasso Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.

London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."

MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

tor Cars—

Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."

Standard Motor Car Co., Coventry. Coventry 530 (4 lines). "Flywheel, Coventry."

bservation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

ckers, Shippers, Etc.—

Pep Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depolep, London."

tent Agents—

King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.

Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.

Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Piston Rings—

British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."

Integral Propeller Co., Ltd., Hendon 9. Kingsbury 104. "Aviprop, Hyde, London."

Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."

Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."

Stanley Aviation Co., 67, Kingsland Road, E.2. City 8347.

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

Radiator Repairs—

Barimar, Ltd., 10, Poland Street, W. Gerrard 8173. "Bariquamar, Reg, London."

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—

C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. Chapeltown 474. "Instrument, Leeds."

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

The Norman Thompson Flight Co., Ltd., Middleton, Bognor. Bognor 48. "Soaring, Bognor."

Short Bros., Rochester. Chatham 627. "Seaplanes, Rochester."

Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."

London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.

Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."

Shock Absorbers (Elastic Cord)—

Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—

Forward Motor Co., Summer Row, Birmingham. Central 6259.

Hobson Manufacturing Co., 20, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."

Sparking Plugs (*continued*)—

Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—

Dart Spring Co., West Bromwich. West Bromwich 322. "Dart, West Bromwich."

Steel—

Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."

Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Berinco, Birmingham."

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466 (3 lines). "Cradock, Wakefield."

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—

Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—

John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London."

Owen, Joseph, & Sons, Ltd., Borough High Street, London, S.E. Hop 3811. "Bucheron."

R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."

The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Weskent."

Varnishes—

Clark R. Ingham, & Co., Caxton House, S.W.1. Victoria 2023.

Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."

Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Welding Repairs—

Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."

London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—

Cradock, Geo., & Co., Ltd., Wakefield.

Woodworking Machinery—

Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."

Wadkin & Co., Leicester. Leicester 3614. "Woodwork, Leicester."

The Aeroplane Buyers' Guide.

Acetylene Welding Plant—

Imperial Light, Ltd., 143, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—

Aircraft Manufacturing Co., Ltd., Hendon, Kingsbury 180.

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation, Newcastle-on-Tyne."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich 851. "Aviation, Norwich."

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Curtiss Aeroplane Co., L. J. Seely, Clun House, Surrey Street, Strand, W.C.2. City 7724.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.

Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."

Grahame-White Aviation Co., Ltd., London Aerodrome. Kingsbury 120.

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."

Mann, Egerton & Co., Aircraft Works, Norwich.

Martinsyde, Ltd., Brooklands, Byfleet, Woking 331; Byfleet 171. "Martinsyde, Weybridge."

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455. "Nieuscout, Crickle, London."

Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."

Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."

Sage, F., & Co., Ltd., Peterborough.

Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Victoria 3673.

Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerlyta, Knights, London."

Waring & Gillow, Ltd., Hammersmith, Museum 5099. "Warisen, Ox, London."

Westland Aircraft Works, Yeovil.

White, J. Samuel, & Co., Ltd. East Cowes. Cowes 3. "White, East Cowes."

Airships—

Airships, Ltd., High Street, Merton. Wimbledon 1314.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, 'Phone, London."

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3.

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Aluminium Presswork (Stampings, Etc.)—

Annealing Furnaces—

Fletcher, Russell & Co., Ltd., 15, Fisher Street, Southampton Row, W.C.1. Holborn 5116-7.

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Brass Sheets for Tipping Propellers—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Buildings—

Boulton & Paul, Ltd. Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Bizfibild, London."

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.

The Whifley Co., Ltd., Salisbury House, London Wall, E.C.2. City 2681-2. "Wrathless, 'Phone, London."

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4070.

Castings—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3.

Castings (Aluminium)—

Coan, R.W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon Dope—

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."

London Label Co., Becton Road, Becton, E. East 1300.

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend."

Hazel & Co., 4, Princes Street, Hanover Square, W.1.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1970.

Component Parts—

Accles & Pollock, Ltd. Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."

B. D. V. Aircraft Spares, Eyon Chambers, 16a, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—

British Aeroplane Varnish Co., Ltd., Milburn House, Newcastle-on-Tyne, and 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."

British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Clarke, Robert, Ingham & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Elastic Cords—

Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electric Cables—

E. Kalker & Co., Coventry. "Kalker, Coventry."

Electrical Accessories—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford 1. "Fump, Bedford."

Arrol-Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."

Beatty School of Flying, Ltd. Beardmore Aero Engs., Ltd., 117, Great Portland Street. Gerrard 238 "Beardaero, London."

Dudbridge Iron Works, Ltd. (Salmons), Victoria Street, London, S.W.1. Victoria "Aeroflight, Vic, London."

Gordon Watney & Co., Ltd. Weybridge 550 (7 lines). "Mercedes, Weybridge."

Green Engine Co., Ltd., Twickenham, Richmond 1293.

Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. Hammersmith 840. "Gwynne, Hammersmith."

Sturtevant Motor Co., Hyde Park, Boston, U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Mordac, Wolverhampton."

The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W. Wallington 408 (2 lines). "Eleverlold, London."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Flying Schools—

Bournemouth Aviation Co., Ltd. Talbot Village, Bournemouth, Bournemouth 340. "Etches, Winton."

Galvanising—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Cowper-Coles Manufacturing Co., Surbiton-on-Thames.

Gears—

Moss Gear Co., Ltd., Thomas Street, Birmingham. East 407. "Mogear, Birmingham."

Glue—

Adams & Co., Ltd., West Bromwich, Isinwich 264. "Reliance, West Bromwich."

Improved Liquid Glues Co., Ltd., Gt. Eastage Street. "Croid."

Mendine Co., 8, Arthur Street, E.C.

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, Acre, W.C. Gerrard 1077. "Comyn, Ching, Westcent, London."

Chas. P. Kinnell & Co., Ltd., 65, Southwark Street, London, S.E. 372 (2 lines). "Kinnell, London."

Instruments—

British Wright Co., Ltd., 33, Chancery Lane, W.C.2.

Machine Tools—

Bliss, E. W., Co., 22, Pocock Street, Southfriars Road, London, S.E. "Blissdon, London."

Brewster & Co., 11, Queen Victoria Street, E.C. City 768. "Circumflame, London."

Magnetos—

The M-L Magneto Syndicate, Ltd., Works, Coventry. "Corlton, Coventry."

Metal Manufacturers—

Chas. Clifford & Sons, Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

Metal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."

Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."

Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2207.

Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041. "Bayliss, Wolverhampton."

The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Foster Engineering Co., Wimbledon. Wimbledon 1800 (3 lines) "Fosteraco, London."

Mann, Egerton & Co., Ltd., Aircraft Works, Norwich. Norwich 482. "Motors, Norwich."

Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261. "Fremo, Birmingham."

Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."

Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."

Seldon Engineering Co., Ltd., Croydon. Croydon 1761-123. "Selig, Cent, London."

Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

Metals in General—

Lucraft, H., & Co., 147, Fenchurch Street, London. E.C.3.

Metric Bolts—

Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

Miscellaneous—

Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."

Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C.

Bowden Wire, Ltd., Willesden Junction, Willesden 2400 (3 lines). "Bowirelim, Harles, London."

Brown Bros., Ltd., Great Eastern Street, E.C.1. London Wall 6300. "Imbrowned, Bethroad, London."

Edison Swan Electric Co., Ponder's End, (Lamps.)

Herbert Frood Co., Ltd., Chapel-en-le-Frith. Central 703. "Frodobrake, Birmingham."

Grano Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.

London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."

MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—

Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."

Standard Motor Car Co., Coventry. Coventry 530 (4 lines). "Flywheel, Coventry."

Observation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Packers, Shippers, Etc.—

Lep Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depolep, London."

Patent Agents—

King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.

Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.

Stanley, Popplewell & Co., 38, Chancery Lane, W.C. Central 1763.

Piston Rings—

British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."

Integral Propeller Co., Ltd., Hendon 9. Kingsbury 104. "Aviprop, Hyde, London."

Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."

Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."

Stanley Aviation Co., 67, Kingsland Road, E.2. City 8347.

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

Radiator Repairs—

Barimar, Ltd., 10, Poland Street, W. Gerrard 8173. "Bariquamar, Reg, London."

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—

C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. Chapeltown 474. "Instrument, Leeds."

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

The Norman Thompson Flight Co., Ltd., Middleton, Bognor. Bognor 48. "Soaring, Bognor."

Short Bros., Rochester. Chatham 627. "Seaplanes, Rochester."

Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."

London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.

Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."

Shock Absorbers (Elastic Cord)—

Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—

Forward Motor Co., Summer Row, Birmingham. Central 6259.

Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."

Sparking Plugs (*continued*)—

Ripault, Leo, & Co., Ltd. (Oleo Plugs), 642, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—

Dart Spring Co., West Bromwich. West Bromwich 322. "Dart, West Bromwich."

Steel—

Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."

Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Berinco, Birmingham."

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466 (3 lines). "Cradock, Wakefield."

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—

Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—

John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London."

Owen, Joseph, & Sons, Ltd., Borough High Street, London, S.E. Hop 3811. "Buchetons."

R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."

The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Westkent."

Varnishes—

Clark R. Ingham, & Co., Caxton House, S.W.1. Victoria 2023.

Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."

Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Welding Repairs—

Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."

London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—

Cradock, Geo., & Co., Ltd., Wakefield.

Woodworking Machinery—

Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."

Wadkin & Co., Leicester. Leicester 3614. "Woodwork, Leicester."

This check will be of the utmost value, as it will immediately show up any twist or inaccuracy in the fuselage, which must at once be rectified, either by alteration of the jig, or alteration of the tie rods, or both, as may be necessary. If the greatest possible attention is not paid to this work, the fuselage will be all of a twist, which will not do, as it will seriously affect the machine when in flight, as the tail plane will be out of the horizontal with the wings, and the fin and rudder will not be vertical, therefore the importance cannot be overestimated.

Bolting Up.

Having checked the fuselage, both rear and front portions, and found them correct, and the joints of the top and bottom longerons in perfect alignment, without any artificial means being used, the fittings for the joints may be placed in position, and the bolt holes carefully marked off. The holes can then be drilled by means of an electric drill and jig, the greatest care and accuracy being required, to ensure the holes being drilled central and vertically through the longerons.

These being done, the fittings can be bolted in position, thus permanently tying the front and rear portions together.

The Next Step.

If the works' manager, or the foreman of the erecting shop, approves of the job as so far completed, the transoms, or cross ties, the seat bearers and the tank bearers, must now be fitted in. But if the fuselage is allowed to remain in the jig whilst this is done, it will delay progress with fuselage No. 2, and as this is not permissible, the fuselage must be very carefully removed from the jig and put on trestles which have been previously levelled up.

In putting in the tank bearers and seat bearers, etc., the tops and bottoms of the front end of the fuselage must be accurately clamped together, before removal from jig, with a distance piece in between, of the correct size to maintain the theoretical width, otherwise the tank and seat bearers will be incorrect.

These having been fitted, the two compression struts, onto which the wing spars butt, must now be put in position, not forgetting when doing so that two fittings, left and right hand, have to be fitted onto the bottom ash spars at the same time, and the bolt holes very carefully marked off, and drilled. After which, the fittings and struts may be put into position and bolted and riveted up.

The flooring can now be fitted in. This will consist of $\frac{3}{8}$-in. spruce, suitably stiffened with longitudinal bearers, the flooring being put in across the machine and screwed down with brass screws.

The Landing Carriage.

Having got so far, it will be as well to consider the landing chassis struts. These, owing to their being splayed outwards, will have to have their ends cut to an angle, where they bed into the strut-fittings attached to the ash front spar. To carry out this work correctly a proper start must be made and the work carried out in a systematic and workmanlike manner.

The first thing to do is to find out the distance from the top longeron to the floor of the shop and allow an extra half-inch for clearance when the wheels are on the axle. Having found the distance from the plan, which we will assume to be about 6 ft. 6 in., place the fuselage on trestles and packing. This height can be measured by placing a straightedge on the top longeron and measuring down to the floor, taking care before doing so to see that the fuselage is level longitudinally and transversely at each end and in the middle.

Having done this, procure a straightedge about 7 to 8 ft. long, and lay it across the top of the fuselage on its edge, over the centre of the front chassis strut. After having marked the centre of length on it with a fine knife cut, and the extent of splay each side, which for our purpose we will call 6 ft. 9 in., which will be 3 ft. $4\frac{1}{2}$ in. each side of the centre mark, attach a blumb-bob to each of these points. Allow the plumb-bob to hang down, and mark the point indicated by the point of the plumb-bob on a nicely planed board which has been screwed to a couple of short trestles or supports, carefully made to coincide with the theoretical bottom of the wooden strut, and levelled up with a spirit level.

Having done this, the erectors will have their top and bottom points to which to fit the strut, and this method will prevent any inaccuracy, as they can utilise the fixed bases in bevelling the strut ends time after time, thus enabling accurate results to be rapidly obtained. Having cut and fitted the top end of the front chassis struts to the top fittings, the struts can be taken out and the bottom junction fitting fitted, bevelled, and bolted onto the bottom of the front strut.

Rear Chassis Struts.

The next thing to do will be to fit the rear chassis struts, which are slightly more difficult, as they splay outwards and rake backwards and upwards. Thus there are two angles to contend with, and for this purpose the angle between the two struts should be carefully obtained from the drawing office if it is not clearly marked on the plan.

The angle should be set out on a setting-out table, and a few stops screwed onto the table, to contain the chassis struts in their theoretical position whilst the rear strut is being shaped and fitted to the fitting. For this purpose the front strut should be clamped down on bearers, which are a sufficient height off the setting-out table to clear any projection of the junction fitting. This will enable the rear strut to be fitted up in an identical angle to the fitting which it will be in when permanently fitted and bolted to the fuselage.

Having bevelled and fitted the rear strut, and having had it checked by the works' inspector and the A.I.D., and stamped, the final assembly can be commenced. After the position of each chassis strut and the fittings on the bottom have been checked, the bolt holes can be drilled in position without further taking down. The bolts can be put in and tightened up and riveted over, thus finishing the fitting up of the chassis, with the exception of putting in the axle and attaching the wheels.

The next thing to do will be to shape up the ash skid post, and fit the skid lever hinge fitting on, which, being more or less similar to bedding in the chassis strut fittings, will require no special remarks. This also applies to the four centre plane struts.

Streamline Fairing.

The streamline fairing on the top of the fuselage at the rear end, aft of the pilot's seat, can now be put in hand. This will consist of 3/16-in. three-ply semi-circular uprights, the highest one being 9 in. high, and the same width as the fuselage, notched out on the radius about 2-in. pitch with $\frac{3}{8}$ in. by $\frac{1}{2}$ in. deep notches to take the $\frac{3}{8}$ in. by $\frac{1}{2}$ in. spruce stringers which run longitudinally with the fuselage to support the fabric. There will be about 10 of these stringers and one extra heavy section on each side for attaching the whole of the fairing to the fuselage. The height of the semi-circular 3-ply uprights gradually diminishes towards the rear, until the tail plane leading edge is reached, where it dies out. The whole of the spruce stringers forming the skeleton framework of the fairing are covered with fabric, which will be doped when completed, and varnished.

The covering on the top of the fuselage in front of the pilot's seat will consist of 20-gauge aluminium sheet strengthened with ash bends underneath, attached to the fuselage and also to the aluminium sheet with brass screws. This will be dealt with later on when dealing with the manufacture of metal fittings and work.

(To be continued.)

CORRESPONDENCE ON AEROPLANE PRODUCTION.

The following letters referring to Mr. Blakeney's articles have been received. Mr. Blakeney's replies are appended :—

I.

Sir,—Many thanks for Mr. Blakeney's admirable article in The Aeroplane on "The Production of Aeroplanes and their Components." May I venture to remark, with reference to his account of saw mills and wood-working shop, the plant he suggests, in my opinion, is hardly sufficient to produce aeroplanes in paying quantities.

The necessary machines, as a sound business proposition, should consist of : a horizontal band-saw, for breaking up large timber, so that you can see how the timber will work out for the next cut ; one power-feed saw, two thicknessing machines, one panel planer, one four-cutter moulder, one plain saw bench, six (not less) spindle moulding machines, one band-saw (3 ft.), one sander, one boring machine, one fret-saw, saw sharpening and grinding machines (selected). With above plant the production would be large enough to go in for supplying builders with the woodwork parts.

Any firm contemplating going in for aeroplane manufacture (the trade of the future), cannot hope to succeed with less. Another very serious consideration is the position of each machine in the saw mills, for the greatest production with less labour. Mr. Blakeney's account of timber storage is very interesting. (Signed) J. J. Buckley.

[In reply to the criticism of Mr. Buckley, I am sorry that he has not noted the small details in my article, as he will, if he reads it again, see that I have specially mentioned the fact that I refer to a "Small but enterprising" firm who, having existing machinery, wishes to utilise it for the production of Aircraft Components, and, further, an engineering firm might not be expected to be fully equipped as a wood-working firm, and would only have machinery for ordinary work, and possibly not much of that, but enough for a beginning.

I am afraid that Mr. Buckley has misunderstood my term "breaking up timber," as I do not consider a horizontal band-saw necessary, except for use in the forest where the timber is felled, and I am not aware that it is ordinary practice.

Also, I hardly think that any wood-working department in a small firm could possibly require six spindles, unless they were supplying spindled work for a number of outside firms, or employed about 500 to 600 hands, as the output of one or two spindle hands, who know their work and are properly and efficiently fed with work, is enormous. For instance, 16 ordinary spars are frequently spindled per 12 hour day per man. I also

pointed out that the layout of the saw mill required very careful consideration. I can only say that Mr. Buckley's ideas are very much larger for a small firm starting than my own. Herein lies the difference, and the answer is "Capital" £ s. d.—S. B.]

II.

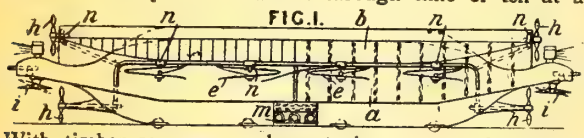
Sir,—May I offer a few criticisms on Mr. Blakeney's article in last week's Aeroplane. It grieves one to see such methods set forth as examples of practice in vogue in aviation firms of to-day, for it gives the impression that we may still be looked upon as a set of amateurs. (You will remember in the early days how the "Engineer," and other superior journals, used to "rub it in.")

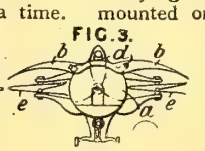
To use the spindle in the manner suggested by Mr. Blakeney would entail altering the jig each time the cutter was ground (and, believe me, cutters do need sharpening sometimes), or else the job would come out over size, equal to the amount taken off the cutter. The proper way would be to work the jig against the ring, which can be adjusted to suit a cutter of any length. But using the spindle for the longerons is wrong altogether.

First, a piece of wood ought to be got out, about 2 in. or 3 in. wide, the length of the longeron, and tapered from 1 9/32 in. to 1 1/32 in. This can easily be done on the overhand planer. The sawyer will use this to bring the longerons off the saw at the proper taper. Finished with the saw and inspection, the longerons would be brought to the overhand to have two edges made dead square: then to the thicknesser with them (our man calls it the mangle). The pattern the sawyer used is also necessary for this operation.

Place two longerons on this pattern, the thick end of the longeron to the thin end of the pattern. Set the table to suit (2 5/16 in.), and push them through, turn them on the other edge, then push them through again. Result—a clean accurate job with a saving of, at least, 50 per cent.

If there were 500 machines to make, of course, you would have a wider pattern and run through nine or ten at a time.

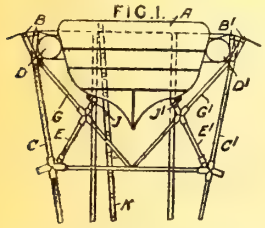


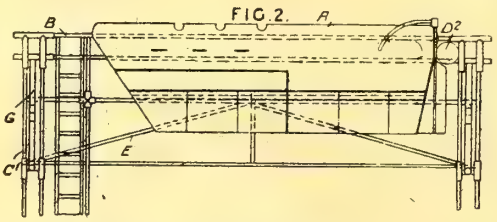


With timber so scarce, why get them out 19 ft. and then cut them in two?

The struts can be tapered on the overhand, without jig or pattern, by merely setting the cut to suit the taper.

To have the timber inspected after sawing, as suggested by Mr. Blakeney, cannot be too much emphasised. It saves both time and temper. (Signed) D. D. Haldane.





[I am glad to find in Mr. Haldane's criticism of my article, that he has been lucky in finding such excellent workers on aeroplane work under his charge, and that they have been natural experts, as, personally, I have found that however well one is trained one has lots to learn. I was speaking of a small minority.

With regard to the use of the spindle in the manner mentioned, this method will be found in daily use in dozens of shops, also the spindle hand checks his cutter distance each time he sharpens, and adjusts, if necessary.

I much appreciate the method employed by Mr. Haldane for spindling longerons, and think it excellent, and shall certainly adopt the method when I have a quantity to deal with.

I should like to know what methods are adopted by Mr. Haldane in tapering struts on the planer, to prevent over-planing and making the strut too small. What does he use as a gauge or jig? I should greatly appreciate his reply, and would like to go further into the matter with him, as it bears on a large field of other work.—S. B.]

A REGISTERED TRADE MARK.

Arrol-Johnston, Ltd., Heathhall, Dumfries, Scotland, announce that their application for the registration of their trade mark, consisting of the words "Arrol-Johnston," has been accepted in Class 22 in respect of motor cars under Sub-Section 5 of Class 9 of the Trade Marks Act, 1905, and they have been notified by the Registrar of Trade Marks that the mark applied for be deemed a distinctive mark.

THE PATENTS INDEX.

The subjoined list of recent inventions has been specially compiled by The Aeroplane from the current Official Patents Records.

Patent Applications.

Browne, W. M. Hangars. No. 9160. June 26th.
Cazanave, A. Aeroplanes. No. 9119. June 25th.
Chambers, M. F. Inclination indicators for aircraft. No. 9161. June 26th.
Goodyear's Indiarubber Glove Maunfacturing Co. Manufacture of aeroplane elements. No. 9418. June 29th.
Hyne, C. J. C. W. Dip-indicator for aeroplanes, etc. No. 9366. June 29th.
Lane, C. Mounting of guns for aeroplanes. No. 9323. June 28th.
Richards, G. Machine tools for milling, boring, and forming screw-threads or casings of aeroplane engines. No. 9253. June 27th.
Rissel, T. A. Instruments for indicating whether airship is flying on an even keel. No. 9222. June 27th.
Smith, W. H. Sight for steroscopic and vertical or oblique aerial photography. No. 9494. June 30th.
Tarrant, W. G. Struts, stays, etc., wooden frame members for aircraft. No. 9123. June 25th.
Thornhill, R. Liquid levels or indicators for aircraft. No. 9286. June 28th.
Wallis, H. E. A. Apparatus for observing, photographing, dropping bombs, etc., from a height. No. 9098. June 25th.

Complete Specifications Accepted, printed copies of which are obtainable on and after July 19th, 1917.

107,208. Sept. 26th, 1916. Robson, J. Aeroplanes and the like.

Abridged Specifications.

105,948. Aeronautics. Holroyd, T. H., Royal Colonial Institute, Northumberland Avenue, London.

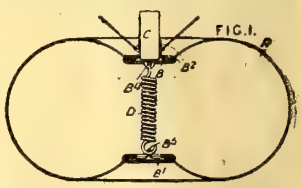
Aerial machines without aerostats; propelling; steering.—A flying-machine comprises a body *a* having gliding planes *b* mounted on longitudinal pivots *d*, a number of lifting-screws *e* arranged beneath the planes, propellers *h* mounted at both ends of the machine above and below the centre line, and elevating and depressing planes *i*. The planes *b* serve to carry the main weight of the machine and can be moved to any angle by control ropes or wires. The lifting screws, propellers, etc., may be operated by independent turbines or electric motors *n* supplied with power from power generators *m*.

106,001. Airships; aerial warfare. Liversedge, A. J., 14, Great Smith Street, Westminster.

An airship, particularly of the rigid type, is provided at the top with a turret serving normally as a platform for guns, searchlights, etc., but constructed in boat or like form or otherwise made buoyant for use in case of a descent at sea. In the form shown, a boat-shaped turret A fitted with floats D, D^1, D^2 is arranged between longitudinal members B, B^1 of the airship framing, and is fitted with rails J, J^1 adapted to rest on longitudinal girders E, E^1 connected to radial frame members C, C^1 and diagonals G, G^1. The floats D, D^1 may be tied to the longitudinals B, B^1 by ropes or other material adapted to be readily cut to detach the turret. A ladder K affords access to the turret.

105,977. Pneumatic springs; aircraft. Sloper, T., Southgate, Devizes, Wiltshire.

A cushioning-device for aircraft consists of an air-cushion A provided with one or more internal ties D whereby two opposite sides are drawn in relatively to the positions they would occupy under inflation if free, the air-cushion being so shaped that, when tied in, it is approximately circular in a plane parallel with the tied-in sides, and means are provided for securing one of the tied-in sides to the part to be cushioned. The tie D may be a rigid link or may be of flexible material, for example, a spring or chain, and is preferably freely hinged at its ends. The air-cushion is secured to plates, B, B^1 which are provided with eyes B^4, B^5, to receive the tie D, the upper plate B being provided also with a socket B^2 for the end of a spar C. The upper plate B may be replaced by a ring mounted inside the cushion and either secured directly to an horizontal supporting-member or secured thereto through a second outer ring. An internal lining for enclosing the tie and securing plates may be provided to prevent leakage of air. When a number of cushions are arranged one behind the other on any particular part of an aircraft, they are graded in size to present a streamline form, and they may be enclosed in a common cover of



canvas. The air-cushions may consist of two hemispherical portions joined by a flexible joint such as is described in Specification 21863/13, and may be constructed of the fabric described in Specification 25605/13. Specification 9045/14 also is referred to.

MARKET REPORTS.

Prices given are for quantities on usual terms.

COPPER.—There have been no fluctuations whatever in the Copper Market during the past month, and no interest whatever appears to be shown in this market.

Current Prices.

Copper Ingot (standard), Cash	£130 per ton.
Copper Sheet	£165 per ton.
Copper Tube	20½d. per lb.
Brass Sheet, 24 G.	16½d. per lb.
Brass Tube S.D.	17d. per lb.

TIN.—The Tin position is still very uncertain, and buyers are very cautious. Apparently the Government have agreed to supply U.S.A. with tin, and there is no doubt that the demand from this direction will soon become very considerable.

During the past week prices have again advanced to £245, and declined to £243, which is the figure to-day.

Comparative Prices.

To-day	£243 5s.
Last Week	£243 15s.
Last Year (1915)	£172 0s.
Highest Price, 1916	£205 0s.

LEAD.—The continued slump in the Lead Market still prevails, and there is no indication of an improvement. If we could be assured of good supplies from Spain the outlook might be a little brighter, but, unfortunately, the troubles there are having a serious effect upon output.

The official price still remains at £30 10s. to £29 10s.

STEEL.—There is a very hopeful feeling in the Steel Market, due to increased output; at the same time it must be borne in mind that the phenomenal demands for national requirements is increasing very rapidly, the last statement being especially applicable to aircraft steels. We understand that, owing to very urgent Admiralty requirements, the output of aircraft steels has been seriously hindered; this is very deplorable, and steps should be taken to remedy this state of affairs. If America could only be induced to help us by supplying certain grades of steel at reasonable prices, the market would be helped considerably, but very little relief is being received at present. As a matter of fact, we are asked to pay twice as much for steel as the English firms are allowed to charge. There does not appear to be any reason why the American Government should not take control of prices.

There appear to be ample supplies of R.A.F. steel sheet, and market prices are fairly reasonable.

Current Average Prices.

R.A.F. 3B Steel	38s. to 40s. per cwt. Basis.
R.A.F. 1E Steel	78s. to 80s. per cwt. Basis
R.A.F. 9A Sheet Steel	32s. to 33s. per cwt.

ALUMINIUM.—Official prices are still the same.

Current Official Prices.

Ingot	£225
Remelted	£210

TIMBER.—The Timber Market is extreme'y difficult, and the chief concern at present is supplies. The outlook cannot be considered bright. Stocks of Silver Spruce are gradually diminishing, there is very little Mahogany and still less Walnut. There are ample stocks of English Ash, but the demand for this wood for Aeroplanes is on the decline. The present time is certainly considered an opportune moment for large shipments of Silver Spruce to be brought from Canada; in fact, if something is not done quick'y to more than replenish the diminishing stocks, the situation next spring will be worse than critical. There have been a few shipments of Mahogany received recently.

Prices still remain very firm, and contrary to expectations, particularly official expectations, the arrival of Admiralty shipments of Silver Spruce has not affected the high prices which have now been ruling for the past few months.

Current Prices.

Silver Spruce, 17s. c.f.
English Ash, 13s. 6d. to 15s. c.f.
Walnut, 2s. 3d. to 2s. 6d. s.f.
Mahogany, 2s. 2d. to 2s. 4d. s.f.

FABRIC.—It is very difficult to understand the ways of officialdom. Seeing that the fabric supplies have been under A.B. control for nearly six months, one would naturally expect they would, by this time, have notified aircraft constructors what price would be charged.

Official Prices (reported).

17C Cloth, 29½d. per yard 36 in. wide.
17C Cloth, 31d. per yard 38 in. wide.

THE AIRCRAFT WORKERS' SPORTS.

All work and no play makes Jack a dull boy, so the aircraft workers of the London District are going to hold their Annual Sports on Saturday, July 21st, at Stamford Bridge Athletic Grounds.

The meeting, which is to start at 3 p.m.—weather and bombs permitting—will be held under A.A.A. and N.C.U. Laws, and under the auspices of the Y.M.C.A. The events will be as follows:—

Description of Events.

*100 Yards Flat.—Run between strings 4 ft. apart up the centre of ground.

Veterans' Race.—Same conditions, with half a yard per year over 41 allowed.

*220, *440, *880, *One Mile Flat, and *Two Mile Walk on running track.

Cigarette Race.—A number of men are lined up facing an equal number of women about 40 yards away. The men have to run up to their lady partners, who light the cigarette in the man's mouth, and the pair then run back to the starting point. The first pair home with the cigarette still alight are the winners.

Sack Race.—Sacks reaching to the neck are used, and each competitor must keep his arms inside the sack. The race is started from the lying-down position facing the opposite direction, turning round and running forward about 40 yards round a turning point and back to the starting point.

Sack Race (Women).—Same conditions, but for women competitors.

*One Mile Relay Race.—Teams of four men each. The position of each team on the track is drawn for (the positions are numbered from the inside of the track). The first man runs 220 yards and hands over the flag to the second man, who also runs 220 yards and passes the flag to the third man, who has to run 440 yards and pass the flag to the last man, who has to do 880 yards or twice round a quarter mile track. The race finishes when the 880 runner has reached the finishing post. Each man in the winning team receives an equal prize.

*Long Jump.—Competitors take a running jump from a white marked board sunk level with the turf, into a pit of loose earth or sand. The jump counts from the take-off board to the mark made by the competitor's heel. The jump does not count if the man steps over the line or falls back after landing in the pit.

*High Jump.—Under usual High Jump conditions.

60 Yards Flat for Women Only.—Start 40 yards up the 100 yards strings and finish at the posts.

Boat Race.—Each team of five men and a cox. stand astride a pole which is held up between the legs. The team runs backwards and is steered round the track by the cox., who faces the direction the team is running. (Just the same as an ordinary boat race, except that a pole is used and the competitors run backward astride the pole.)

*Tug-of-War.—Eight men in each team, any weight. The rope is marked with a tape six feet each side of the centre tape, and the ground marked correspondingly. When the side tape is pulled over the ground mark on the other side of the centre line—making a 12 ft. pull—the pull is finished.

½ Mile Boys' Relay Race.—Same as the Mile relay race, except that each boy runs 220 yards. (For boys under 16 years of age.)

100 Yards Flat.—Same as for men, but competitors must be under 16 years of age.

Obstacle Race.—Run on a separate course inside the running track.

Pillow Fight.—A pole is supported on tripods about 4 ft. above the ground, and each competitor has to try and upset the other's balance by striking him with a soft pillow. Competitors are disqualified if they touch the pole with the hands.

Cycle Race.—½ mile round track.

Cycle Race.—3 miles round track.

*The ten events marked with an asterisk, thus *, count for the Aircraft Works Championship.*

Entries may be sent in by any firm in which not less than 75 per cent. of the workers in the particular department entering are employed on aircraft work. Entries must be in the hands of the Hon. Secretary by Saturday next, July 14th, though one ventures to suggest—quite unofficially—that if the employees of any firm only decide to enter on Saturday, and lodge their entrance fees by Monday morning, July 16th, they will be accepted as competitors.

The entrance fees are 1s. per man for the first Championship event, and 6d. per event afterwards. For boys the entrance fee is 6d., and for women 4d. each event.

All correspondence, entrance fees, etc., should be addressed to the Hon. Sec., Mr. J. T. Clark, Y.M.C.A. Building, Tottenham Court Road, W.C.

The following firms have already entered teams for the

Championship events:—Integral Propeller Co., Darracq, Napier, Gwynne, Handley Page, Grahame-White, Aircraft Mfg. Co., Wells, British Light and Ignition (Blic), British Caudron, Palmer Tyre, Aircraft Supplies Co., Highgate Aircraft, Triplex Safety Glass, Hooper, Improved Liquid Glue (Croid), British Cellulose (Novellon), Rotax Accessories, Cellon, Glendower Aircraft, Whitehead, Sopwith, and Maple.

Last year only ten firms entered, and they provided 1,500 competitors, so this year the officials of the meeting seem likely to have a fairly busy time.

Prizes have been given by the following firms:—Triplex (Challenge Trophy and Cup), British Cellulose (Cup), Aircraft Mfg. Co. (Cup), Aircraft Supplies Co. (Cup), Whitehead (Trophy and two Cups), Auster (Cup), Darracq (Cup), Highgate Aircraft (Cup), Cellon (Cup), and The Aeroplane (Cup). Donations have been given in addition by the following:—Highgate Co., Hooper, Napier, Integral, Croid, Darracq, Palmer, Aircraft Mfg. Co., Auster, Triplex, Goldsmiths' and Silversmiths' Co., and The Aeroplane.

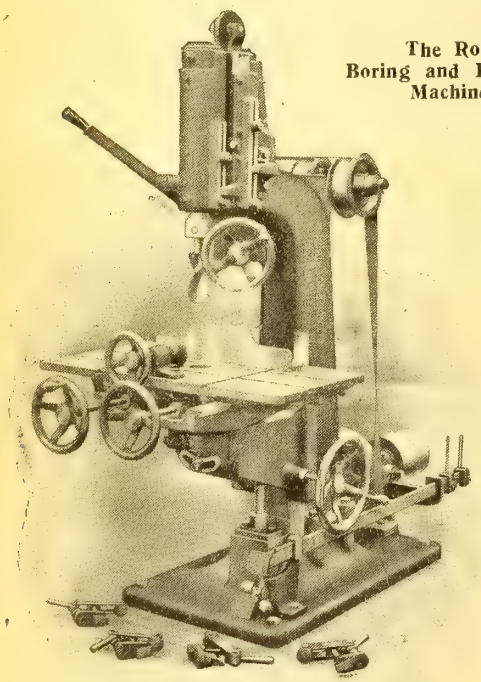
Given anything like decent weather, the attendance is expected to exceed 10,000, so adequate provision is being made for teas and light refreshments. The prices of admission will be 6d., 1s., and 2s. 6d. (including amusement tax); children under 12 will be admitted at half price, and sailors and soldiers in hospital uniform will be admitted free of charge.

A BORING AND RECESSING MACHINE FOR AIRCRAFT.

A special boring and recessing machine for aircraft work, which has recently been evolved by Thos. Robinson and Son, Ltd., of Rochdale, is shown in the accompanying illustration. It was primarily designed for boring the bosses of airscrews and propellers, but may also be used for recessing and routing out panels in ribs and spars, either from the solid or in 3-ply.

The ordinary type of boring machine, particularly where the spindle passes through the bearings, failed to satisfy the demands for exact work and range of movements required in the boring and recessing of propellers.

The machine now illustrated is claimed to leave a perfectly clean and true centre hole in the boss of the largest propeller,



The Robinson Boring and Recessing Machine.

using a two-wing twist bit as known to most machine woodworkers.

The makers claim an important improvement in the mounting of the spindle, the whole head, with its bearings, rising and falling bodily, giving the maximum support to the spindle at every position. The bit need only be steadied by its own shank in the spindle chuck, and by simply changing the boring bit or tool, a propeller boss can be completely bored, rounded on the edge of the hole, recessed when necessary, and the bolt holes drilled without disturbing the setting of the work, i.e., the propeller of the machine table.

A feature of the machine is the compound movements of the table, which give all the required positions for drilling the various holes.

When recessing panels in the ribs and spars of aircraft, a profiling, or forming plate, is used below the work, to give the shape of the panel required; the work being passed under the cutter by hand-feed.

A large diameter cutter-block, or recessing cutter, of suitable shape is all that is necessary for half lapping, the timber being traversed past the cutter by hand-wheel and screw to form the recess or half lap.

The new machine offers a solution of the one speed objection often found in boring machines of the old type. Many only give one speed of about 1,000 revs. per minute, while the machine now described has three speeds, viz.:—1,200, 2,000, and 3,000 revs. per minute.

The spindle-head has a vertical movement by hand-lever of 6 in., and by screw 6 in., the maximum combined movement being 10 in. The distance from the centre of the spindle to the machine pillar is 18 in., and the spindle is arranged to swing cutters up to 7 in. diameter in the top-most position. Larger cutters can be used when the spindle is lowered slightly.

The table is 39 in. by 19 in., and is slotted to carry a back fence and screw cramp, and also eccentric lever cramp. It has a longitudinal traverse by screw of 15 in., and a cross traverse by screw of 9 in. The maximum distance between chuck and table is 24 in. The table will cant 30 deg. sideways and to the front. Adjustable stops are arranged to pre-determine the movements required.

The fast and loose driving pulleys are 8 in. diameter by 4½ in. face, and run about 750 revs. per minute. This machine, although primarily designed for aircraft work, it will be readily understood, has a wide application for general woodworking, especially where large multiple or fine limit work is required. The makers urge that it is not only useful "for the duration of the war," since it will be a live and economic factor in any scheme for changing over from War to Peace work.

MEERLOO—HIS MARK.

Neolithic man was fond of making marks—chiefly upon the cranium of his next cave neighbour, and like any other human attribute which one cares to mention, the tendency has developed throughout the ages.

Any amateur archæologist will take one round the Babylonian Hall at the British Museum and will point out with something approaching self-satisfied smugness how the Ptolemies and the Rameses commemorated the more successful enterprises of their expeditionary forces by erasing the names of conquered monarchs from tombs and monolithic edifices, and by appending their own names in the current edition of "Pitman's own."

The penchant for making marks ran through successive ages and stages, expressed by Julius Cæsar in writing, by Caxton in type, and by the mid-Victorian schoolboy with his pocket-knife upon the walls of the family pew.

This is but a digression, if one can digress before one has started. It is merely an illustration that there is nothing new under the sun.

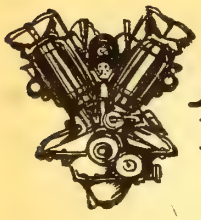
The duty of the moment is to introduce to the Aircraft Industry a firm which specialises in the making of marks—big and little.

Messrs. John Meerloo and Sons, of Cleveland Street, Mile End, E., have for many years been engaged upon the production of marking materials of all kinds.

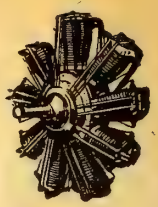
Steel stamps of various kinds are supplied to the Aeronautical Inspection Department for marking both wood and metal parts, special attention being given to the manufacture of very small stamps for A.G.S. parts and similarly minute articles.

The firm supplies standard sets of letters and numerals of all sizes for stamping and branding steel, iron, leather, and wood, and practically every other material, to say nothing of animals.

Messrs. Meerloo and Sons also manufacture stencil plates and brushes for marking both aeroplanes and their packing cases. It is hardly necessary to mention that any inquiry, mentioning The Aeroplane, will receive careful and prompt attention.—W. L. W.



AERO-MOTORS
IN KIND AND CONSTRUCTION



By Geoffrey de Holden-Stone

The Likeness of the Unlike.

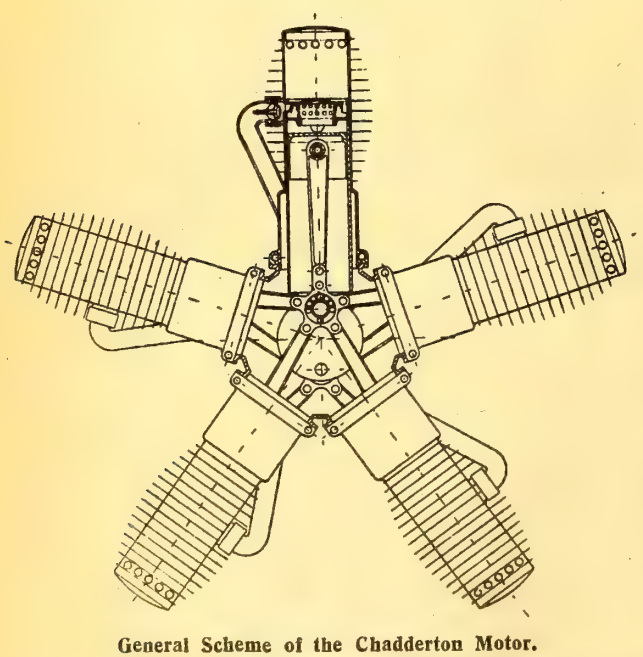
As one continues to analyse two-stroke practice, the more do two conclusions become evident. The first is that the successful designer must not only be a physicist, but that he must really look first of all to physics to provide or suggest his mechanical means. And the second is the extraordinary similarity of the working principles employed, the manner of employment being, as often as not, the sole difference: patentable, at any rate.

So much so, that scanning the mechanical part of the proposition for the first time, one wonders how possibly infringement can have been avoided—especially if the mechanical consequences are identical, as often happens—until one finds that the purely physical methods have somehow constituted the originality.

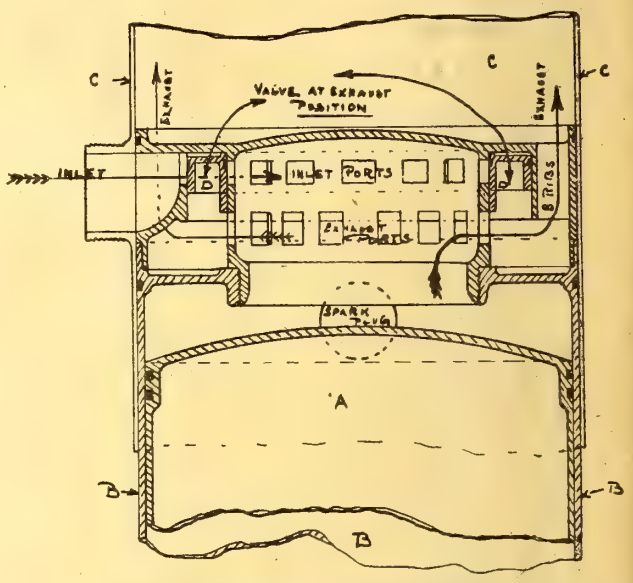
Never have I seen such a positive example of this as the Chadderton two-stroke radio-rotary motor—it may be worked either way—as compared with another, which is the subject of much quaint official secrecy at the moment, although its patents have been published for the last few years. So alike are both, indeed, that one would say that the latter had priority in all the more important physical and mechanical results, and that it was only the combination of these with certain minor details—physical again as well as mechanical—that saved the situation for the former. The other motor, nevertheless, is the simpler, being absolutely valveless; whereas Mr. E. Chadderton's design does embody one valve for each cylinder. At the same time, if made up as a vertical or V type, as the other is, I see nothing to prevent it being made up to equal power-possibilities—which I happen to know are extraordinary—far greater than in its roto-radial types as illustrated.

Type and Variation.

Here, again, one would imagine off-hand that such a thing as an *automatically operated exhaust valve*—positively operated by the difference of pressures above atmospheric, not minus as in ancient four-stroke practice, combined with a certain amount of centrifugal action—was somewhat of a novelty. However, such a one is the Chadderton valve.



General Scheme of the Chadderton Motor.



Port Arrangement of the Chadderton.

Yet Mr. Frederick Lamplough in a four-stroke practice patent did the same thing years ago, with a pot-shaped type of valve fitted with piston-rings. I too plead guilty. The chief difference was that the Lamplough design employed one such valve for the induction and another for the exhaust. I, on the other hand, by different means, including an outer sleeve, made a single valve—consequently much wider, with less lift—serve both purposes. Just as the Chadderton design does. But the Chadderton valve is not pot-like—being of annular channel section—and has no piston rings nor any auxiliary mechanism. Which we may freely admit is the next best thing to the absolutely valveless proposition I prefer. Even a success does not wholly satisfy.

The Common Aim.

Generally, the purpose of the Chadderton design is the same as that of the nearest compeer aforesaid: that is to obtain greater reliability, to give more power for a given weight without any special lightening of the construction—thus leaving all possibilities in that direction well in hand—to reduce noise and vibration; and finally to secure this last result by balancing the pressure of the gases—both in compression and combustion effort, as well as the reciprocating parts.

Both, curiously enough, get all these results by precisely the same physical and mechanical means, as will be presently seen. Yet the working cycle of each is different.

Thereby, they succeed, where Koch and the original Arrol-Johnston, the Lanchester, Ochelhauser, Junkers, and the Gobron Brillie just failed. All these latter, it is true—which embody duplicated pistons working in opposite directions—have managed to balance the explosion effort, but they failed to balance the reciprocating parts as well by combining both kinds of balance for the motor as a whole.

All of them again—in addition to valve troubles and loss of power sustained in valve-gear operation—possessed certain inherent defects of design, wholly irremediable as that design stood. Some too, such as the Ochelhauser, the Clerk and others,

had also two or more pumping cylinders apart from the working ones: so were rather more complicated than usual, and cost more to build.

And its Joint Success.

But in these two special cases—in which the combustion chamber actually moves up and down—a positive all-over balance is created. Furthermore this great mechanical result is obtained—as will presently be seen—that owing to the special combination of the two pistons in each cylinder with the crank-shaft, the whole of the combustion stresses are taken by the pistons, and not by the cylinder at all.

The unique physical feature of the Chadderton design, however—and therewith the embodiment of its chief purpose—is that the induction system is such that it is practically impossible for the motor to take fire during flight or at any other time. Not only is there no mixture in the crank-chamber at any time, but *none even reaches the cylinders until just before the moment of combustion.*

The Mechanics Thereof.

Now it is known that the two chief factors of efficiency in any i.c. motor are extreme volume combined with extreme rapidity of expansion after ignition. This is secured in both cases by means of two concentric pistons—that is, closely fitting one within the other—the inner one being of the ordinary type, but the outer one in the form of a sleeve of such a length that it still contains the inner piston when both are at full outstroke.

The inner piston is connected by a single rod to the middle crank, and the sides of the outer piston by two rods to the outer—and opposite—cranks of a three-throw crank-shaft element. This single shaft element of course suffices for either the rotary or radial type of the Chadderton; but, as with the other, in its vertical or V type, it is continued with one, three, or five further elements to make up the battery of two (or four en V.), four or eight, six or twelve.

Some Special Consequences.

In both cases—and in all available types—certain unique results follow from this arrangement. In the first place, with the combustion shock driving the pistons apart on opposed cranks at 180 deg., the crank-shaft is, so to say, floated between the opposed—or rather double-ended and bi-motional—efforts. Consequently not only are the torque stresses distributed evenly round the shaft-mass in half the time, but it is practically impossible for knock to occur in the bearings; which are thus reduced to mere guides for shaft rotation with all wear eliminated beyond what occurs from rotary friction.

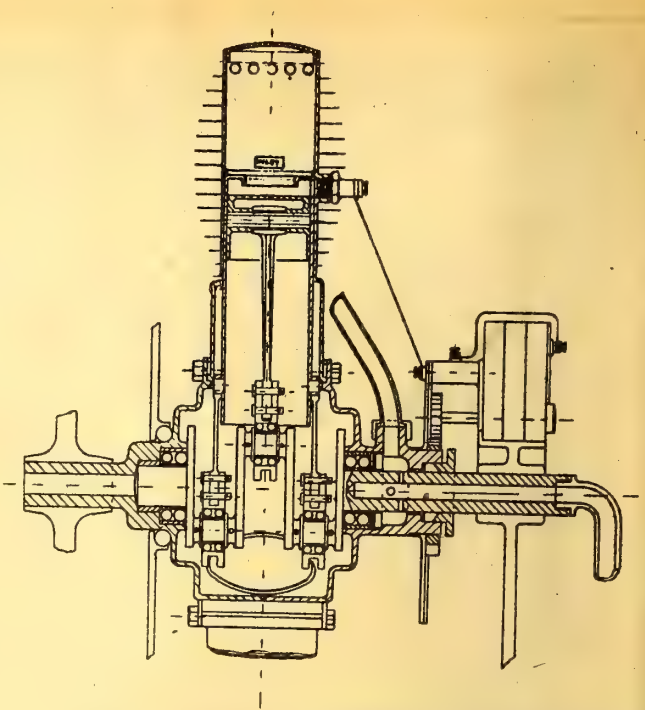
Secondly the weight of the sleeve piston in any cylinder is balanced by the compression of the charge (or the induced air) beneath it and by the weight of the corresponding piston in the next cylinder. This is so in both the roto-radial Chadderton and in the vertical other make: the balance thus effected being practically perfect.

But in any V type arrangement of either, it will be obvious that the sleeve piston in one cylinder must precisely balance the sleeve piston directly opposite to it, so that the perfection of balance both of combustion efforts and reciprocating parts must be made absolute.

And a fourth unique feature of this crank-shaft arrangement is this, that the leverage effect of these opposed cranks is practically doubled for their given length as compared with the ordinary crank-shaft: the throws being halved as well as the piston-speed. Inertia stresses, being opposed, also cancel each other out, and as we have seen, vibration has also been eliminated. Consequently certain further peculiar points arise. One is that every inch of throw-increase becomes equal to two inches in the ordinary way. Added to this—paradoxically enough, it being the converse of long-observed results in conventional practice—the longer the stroke the higher the revolution speed becomes. Which is all to the good, seeing that shaft-speed in r.p.m. is the soul of i.c. motor-power anyhow, within limits, and has hitherto been the chief limitation in two-stroke practice.

The Outcome—and the Difference.

So the final outcome for the Chadderton motor as well as the other valveless one, is that a power-stroke—"double-ended" and hence twice as long—and a leverage effect twice as great can be obtained with cylinders of no greater length, and a crank-chamber neither deeper nor wider, than in an ordinary motor of half the stroke and crank-throw. The possibilities then of this order of design for the creation of a really hefty power-packet—yet withal of a comparatively medium r.p.m. speed—need hardly be argued.



Section through Shaft of the Chadderton Two-stroke Rotary Motor.

From this point, however, the ways of design divide; and the individual differences between the Chadderton motor and the older one become apparent. In both cases the cylinder proper is a mere piston-casing and guide, sustaining no whit of the explosive shock; therefore needing but the lightest attachment, and incidentally, capable of being made of any suitable light alloy of sufficient toughness, and a low coefficient of expansion; good but not excessive radiating and anti-frictional quality being also highly desirable. So the mere fact that the Chadderton motor as shown happens to be air-cooled while the other is water-cooled is a mere type consequence.

Again, the outer piston in each case is naturally of the differential type with the cylinder likewise enlarged to form an annular pumping chamber around its lower part.

But here comes in the difference between the Chadderton and not only the senior design, but any other motor: and most of it is comprised in the special pressure-operated centrifugal valve, which is really the mechanical gateway to the entirely novel induction system and its result, which is the chief object of the design.

As will be seen from the larger illustration, this valve is of channel section, and fitted like an annular collar around, and within the top of, a dome-like extension—the actual combustion chamber—screwed into the head of the outer piston. And it will also be seen that the inner flange of the valve is the deeper: so much so as to cover either of the upper or lower rows of ports cut in the combustion chamber and the intermediate metal thereof.

The immediate questions then are, why are the ports set in contiguous series? and why is the inlet series above the exhaust? To the former, the answer is that the same valve has to cut one and the other series out and in alternately—which obviously allows no great movement—and to the latter that it is above all things desirable in two-stroke practice to separate the induction entry—especially if under pressure—as widely as possible from the final exhaust exit. Which great principle, curiously enough, was chiefly, if not solely, established by the designer of the other motor, after years of costly experiment.

(To be continued.)

(*Continued from page 908.*)

as a pilot and by his mental ability, and was gazetted a flying officer in October, 1914.

On active service his outstanding qualities were soon displayed. He won the D.S.O. on April 19th, 1915, for his gallantry and cleverness in bombing an airship shed at Gontrode in Belgium, when he descended to 200 ft. to make sure of his aim. The shed was protected by a kite-balloon, which Lieut. Hawker (as he then was) used as cover against guns below. By coming down directly above it in a small spiral, he prevented the guns from firing at him for fear of hitting the balloon, and the men in the balloon basket were unable to see him to fire at him. He dived past the balloon and then resumed his small spiral underneath it, so that again the gunners were afraid to fire upwards, and the balloonists were afraid to fire downwards for fear of hitting the people on the ground. As a result he burnt the shed and returned untouched.

The feat by which he won the V.C. on July 25th, 1915, was the culmination of a long series of successes against enemy aeroplanes. The citation says :—"When flying alone he attacked three German aeroplanes in succession. The first managed eventually to escape; the second was driven to ground damaged; and the third, which he attacked at a height of 10,000 ft., was driven to earth in our lines, the pilot and observer being killed. The personal bravery shown by this officer was of the very highest order, as the enemy aircraft was armed with machine-guns, and all carried a passenger as well as a pilot." This award appeared in the "Gazette" of August 25th, 1915.

Thereafter his career was one of continuous success. He combined in a most remarkable degree skill as a pilot, ingenuity as a mechanic, accuracy as a shot with machine-gun or pistol, and bravery as a fighter. These qualities alone were sufficient to make him the best air fighter of his day, but over and above them he possessed administrative ability of a very high order, and the faculty of leadership, so that his junior officers and men loved him as a man and respected him for his capability as a commanding officer.

When he became a squadron-commander, not only was his squadron always to be relied upon morally as a fighting unit, but it was always so efficiently organised as to be ready at any moment to do effectively whatever work was placed upon it. So highly was he esteemed by his seniors that it was generally recognised, just before his death, that he was to take command of the next wing to be formed, and had he lived there is little doubt that in little more than a year he would have had a brigade, so that he would have rivalled General Freyberg in youthfulness among Brigadiers.

Lanoe Hawker belonged to the famous West Country clan of Hawkers and was related to the well-known novelist Lanoe Falconer—hence his peculiar first name and the novelist's assumed second name. He was born and brought up as a child in Australia, so that the Southern Continent may claim some of the credit for producing one of the most brilliant young officers in the British Army.

Personally he was an excellent example of the British professional soldier—and one can imagine no finer type among all mankind. He was well built and athletic, short rather than tall, and distinctly good-looking. He possessed a singular charm of manner and a magnificent sense of humour, which might have misled one into thinking him to be merely the amiable and intellectual young English officer whom everyone likes, if it had not been for his eyes, which had that curious tigerish quality which, to the observant, always indicates the born man-killer, and in his case made just the difference between a very clever sapper officer and one of the greatest exponents of air fighting whom the war has produced.

When Lanoe Hawker died the public news sheets had not discovered the value of air fighters as "star turns," but in his day he was a more than worthy predecessor of Immelmann, Bölcke, von Richthofen, Guynemer, Nungesser, and our own most efficient chaser pilots. All who have served under him or with him hold him in the deepest affection and respect, and to-day, when enthusiastic young officers are acclaiming the merits of some particularly efficient and popular squadron or wing commander, one may hear some war-worn veteran, aged about twenty-two or so, cut in with the remark, "Yes! But you never served with L. G. Hawker." Let that be his epitaph, for it sums up the esteem in which he was held.—C. G. G.

MACKINTOSH.—Sec. Lt. Charles Mackintosh, R.F.C., whose death at the age of 38 on active service in France was recently announced, was educated at the City of London School, and had been living in Germany for some years before the war. A year before the outbreak of war he crossed into Switzerland, becoming Winter Sports representative of the Royal Automobile Club and a "Daily Mail" correspondent, whose thorough knowledge of the French and German languages was especially valuable. Together with several other journalists he was falsely accused of spying, and for 10 weeks was imprisoned in Berne before the trial by court martial, when he was acquitted. Mr. Mackintosh was very well known in Switzerland in all winter sports centres: the official paper of the Automobile Club de Suisse, in a notice on his death, quotes him as "a great friend of our country, who had done much for the development of sport in Switzerland."

Towards the end of last year Mr. Mackintosh joined the R.F.C. and was an observer in the 18th squadron. The manner of his death was all that an aviator could desire, quick, sudden, and in the middle of a fight with an enemy machine. Shot in three places, he must have died instantly, while the pilot, although mortally wounded, brought the machine down safely, dying himself immediately after landing.

His flight commander wrote: "Two days before, he was up with me, and together we managed to save another of our machines which had two H.A. on his tail. I shouted to old Mac and turned on the Huns and he got his gun on them before you could say knife, and before we were really close they had had enough and turned off home. . . . It was a very great pleasure to have so stout a fellow and one so keen on his job as Mac, and he will not be forgotten in the squadron."

The widow and three children of the late Mr. Mackintosh are living at Gryon-sur-Bex, in Switzerland.

MANN.—Sec. Lt. Stanley W. Mann, R.F.C., killed during a fight in the air with four enemy machines, was educated at St. Olave's Grammar School, London, which he left as a senior Oxford scholar. He began his flying career at the Hall Flying School, Hendon, received his commission in the R.F.C. on March 6th, 1916, and flew to France in June of the same year. He was reported by his Flight Commander as one of their finest pilots. Mr. Mann was the only son of Mr. and Mrs. Walter Mann, of Erncroft, Twickenham, and was 21 years of age.

MARTIN.—Sec. Lt. Fairlie Russell Martin, Royal Scots Fusiliers, attached R.F.C., the only child of Fleet Paymaster W. E. R. Martin, R.N., C.M.G., and Mrs. Martin, was educated at Bedford and Sandhurst. He joined his regiment in April, 1916, and went to the front in the following July, serving with his battalion throughout that year's offensive and in the fighting in the early part of 1917.

Last March he was attached to the R.F C., and was killed on June 29th, aged 19, while carrying out important work for which he had been specially selected on account of his excellence as an observer. His squadron commander writes:—"He was one of my most promising observers and showed the most tremendous keenness and cheerfulness over his work. His loss is very much felt both from the point of view of the squadron and personally."

MILLS.—Major Gerald Desmond Mills, R.F.C., who died as the result of an aeroplane accident abroad, aged 26, was the youngest son of Canon Mills, of Bennington Rectory, Herts. He was educated at Haileybury College, and having passed through Sandhurst obtained a commission in October, 1910, in the Sherwood Foresters, in which regiment his elder brother was killed in the South African War. He served 3½ years in India, and, returning home on leave in March, 1914, joined the R.F.C., and obtained his flying certificate.

He was gazetted flight commander in March, 1915, and went to France in the following month, and was mentioned in dispatches. He returned as instructor at the Central Flying School in January, 1916, and was gazetted squadron commander in March, 1916. He was appointed to command the Test Squadron in July, and went to the Air Board Office last March, and shortly after applied for work on active service. He went to the front on May 15th, and was killed four days later.

The brigadier-general under whom he served at the Air Board Office writes:—"He was a very fine and very gallant pilot and a real good officer, and he did particularly good work when commanding the Test Squadron. . . . He is a great loss both to the R.F.C. and to me personally."

MOSS.—Sec. Lt. William Thomas Gregory Moss, attached R.F.C., was flying over an aerodrome on July 5th when his machine fell and he was killed.

NIXON.—Capt. William Eric Nixon, K.O.S.B., attd. R.F.C., eldest son of the Rev. W. H. Nixon, vicar of Winster, now Senior Chaplain of the Forces, and Mrs. Nixon, was born in 1897, and educated privately and at King William's College, Isle of Man, where he was captain of the school in 1913-14. He entered Sandhurst by nomination in May, 1915, passed out in November, and was gazetted second lieutenant, being promoted captain in November, 1916. He was twice mentioned in dispatches and three times wounded in action. On May 7th he was reported missing, and is now reported to have been killed while leading his flight. He was buried by the German Divisional Chaplain, with military honours, in the churchyard at Masny, near Douai, on May 11th.

PLATT.—Capt. Lionel Sydney Platt, Lancers, attached R.F.C., the only son of Mr. and Mrs. Sydney Platt, of Wargrave Manor, Berks, was born in 1885, and educated at Eton and Magdalen College, Oxford. He obtained his commission in the 17th Lancers in 1905, and served with them in India, and distin-

guished himself as a gentleman rider. He was appointed Adjutant of the Denbighshire Yeomanry in 1913, and served with them at home and in Egypt.

He joined the R.F.C. in September, 1916, got his wings in November, and went to the front in December. In March he was gazetted Flight Commander, and was killed on April 13th while leading his flight on a reconnaissance. In 1914 Capt. Platt married Miss Gillian Warwick, and leaves a daughter.

POWER-CLUTTERBUCK.—Sec. Lt. James Edward Power-Clutterbuck, Royal Field Artillery, attached R.F.C., killed in action, was the son of Mrs. Power-Clutterbuck, of Newark Park, Gloucestershire, lady of the manor of Ozleworth, and was born in 1893. He got his commission in the Royal Artillery in January, 1915, and recently was attached to the Flying Corps.

PROTHEROE.—Lt. W. B. Protheroe, R.F.C., who was killed on June 21st, aged 25 years, was the younger son of Mr. W. H. Protheroe, of Park Crescent, Llanelly. From 1910 he served in the Territorial R.E.'s, and rejoined as a sapper at the outbreak of war. He obtained a commission in the Welsh Regt. early in 1915, and fought in the Battle of the Somme. Last January he transferred to the R.F.C., and had been flying continuously until he met his death fighting three enemy aeroplanes. He was well known in South Wales Rugby circles.

ST. CLAIR SMITH.—Sec. Lt. Eric St. Clair Smith, R.F.C, attached to the R.F.C. school at Brooklands, was killed through a fall of an Army biplane on July 3rd. Sgt. Wilson, his pilot, was conveyed to hospital suffering from grave injuries to his head and internally. The machine was several thousand feet up when it is alleged to have crumpled in the air. Mr. Smith belonged to Forest Gate.

SHARPE.—Sec. Lt. Maurice Sharpe, R.F.C., who was reported missing on Oct. 28th, 1916, now unofficially reported killed on that date, was the youngest son of Sir Alfred and Lady Sharpe, Elmshurst, Lancaster. He was aged 29.

He served throughout the Cameroons campaign as temporary lieutenant in the Nigerian Regt. After the conclusion of that campaign he obtained his commission in the R.F.C. on June 3rd, 1916, and proceeded to France on Sept. 6th.

STEPHEN.—Sec. Lieut. James Pedraza Stephen, R.F.C., who was killed on May 23rd, aged 19, was the second son of Mr. A. G. Stephen, manager in Shanghai of the Hongkong and Shanghai Banking Corporation. He was educated at Dollar Academy and Glenalmond, where he was captain of the Rugby fifteen, 1915-16, and Pipe-Major to the School Cadet Corps.

He received his commission in the R.F.C. in May, 1916, and after obtaining his "wings" joined the Army at the front in October, 1916. His squadron commander writes:—"He was absolutely fearless as a pilot and had no fear of anyone in the air. There seems little doubt that he attacked two machines below him—a typical action on his part, as he was very keen to make good on the new machines which we have and with which he was delighted. He was shot down, his machine falling in our lines, and died soon after. His loss is felt by the squadron to an indescribable degree."

SYKES.—Lt. Harold Keith Sykes, Royal Fusiliers, attached R.F.C., who died at a casualty clearing station on June 29th of injuries received while flying on June 23rd, aged 25, was the eldest son of the late J. D. Sykes, of Messrs. Few and Co., London. He was educated at Sevenoaks and Haileybury College. When war broke out he was studying law, but at once joined the D.C.L.I. He obtained his commission in the Royal Fusiliers on February 26th, 1915, and went to France in July, 1915. He was wounded on July 15th, 1916, and after some months in hospital joined the R.F.C., obtained his wings, and went to the front.

His C.O. writes:—"Although your son had not been with us very long he proved himself to be one of the very best comrades that one could possibly wish to have, and all through the very strenuous times which we have had on this particular part of the line recently he showed the most undaunted courage, always carrying out his duty no matter what obstacles came in his way. We shall always honour and respect his name." His younger brother, Capt. R. A. Sykes, Royal Fusiliers, died of wounds two months previously.

THORNE.—Capt. Guy Stafford Thorne, R.F.C., missing since March 18th, brought his aeroplane and observer safely to earth on that day, but died of wounds shortly afterwards. He was born in 1882, was educated at the Wolverhampton Grammar School, and became an electrical engineer. He obtained the appointment of engineer to the Chinese Government Power and Light Station at Canton. Shortly after the war broke out he obtained leave of absence, and was given a commission in the R.F.C. He became an expert pilot, soon attaining the rank of captain.

He was the second son of the late Edwin Henry Thorne, solicitor, of Wolverhampton (a lieut.-colonel in the Territorial Forces), and Mrs. Thorne, of The Roseries, Down Road, Bexhill, whose only other son, Lieut.-Colonel Harold Underhill Hatton Thorne, was killed in action on May 9th. He married, in November last, Mary Gwendoline Charlotte, only child of Commander Hillman, R.N., of Invergordon.

TROLLOPE.—Sec. Lieut. William Kennedy Trollope, R.F.C., who died on May 3rd of wounds received in action on April 3rd, was the younger son of Mr. John E. Trollope, F.R.I.B.A., of Esher. Born in 1896, he was educated at St. Christopher's, Eastbourne, and Uppingham. He received his commission in the R.F.C. in May, 1916, and being gazetted flying officer in July, 1916, proceeded to the front. He had been out over the enemy's lines, and was returning when he was attacked by five German aeroplanes at a height of 5,000 ft. His observer was killed, and he was shot in the abdomen. The machine, however, made a marvellous landing just inside our lines, but upside-down. The machine was being shelled on the ground by the enemy when an infantryman went bravely out to bring Mr. Trollope in. The man found him alive, but unconscious, and in carrying him to safety was himself dangerously wounded. His commanding officer writes:—"I need not tell you what a loss he will be to us. He was simply splendid."

VICK.—An inquest was held yesterday in Yorkshire on the body of Sec. Lt. Kerneth Jessen Vick, R.F.C., who was killed in an aeroplane accident, at the age of 28.

An officer said he did not know the exact cause of the accident, but a special Accidents Committee from London would investigate, and the decision rested with that committee. The witness also stated that relatives of men killed accidentally would not be allowed to be present at the inquiry.

The jury, in returning a verdict of "accidental death," entered a protest that even public inquests into the cause of loss of life were now to be put under military control. There was no valid reason why parents should be refused admission to such inquiries or why an English jury should pass a verdict when they had no knowledge of the cause of the accident.

WYATT.—Capt. Felix Wyatt, Suffolks and R.F.C., only and dearly loved son of the Rev. J. D. K. and Mrs. Mahomed, Ingham Rectory, Bury St. Edmunds, was killed in action on July 2nd. He was 28 years of age.

ENGAGEMENTS.

CLARKE—NEILL.—The engagement is announced of Captain A. J. Michell Clarke, Gloucester Regiment and Royal Flying Corps, son of Dr. and Mrs. J. Michell Clarke, of Clifton, Bristol, and Eileen Buchanan Njal, only daughter of Mr. and Mrs. Harold Neill, of 22, Eldon Road, Kensington.

KERSHAW—FAIRCLOUGH.—A marriage has been arranged between Sec. Lt. C. D. Kershaw, of Cape-town, the Duke of Wellington's West Riding Regt. and R.F.C., and Elsie May, only daughter of Mr. and Mrs. R. A. Fairclough, of 25, Kensington Palace Gardens. The wedding will take place at St. Mary Abbot's Church, Kensington, on July 25th, at 1.30 p.m. No invitations will be sent out, but friends will be welcome at the church and afterwards at the house.

KNOTT—SULLIVAN.—A marriage has been arranged, and will shortly take place, between Mr. Ralph Knott, R.F.C., Adelphi Terrace, and Miss Josephine Sullivan, 49, Drayton Gardens, daughter of the late A. M. Sullivan and Mrs. Sullivan, of Dublin.

MARRIAGES.

BOURKE—ASHHURST.—On June 30th, at St. Paul's, York, Lt.-Col. U. J. D. Bourke, Oxford and Bucks Light Infantry and R.F.C., only son of Surgeon-General Sir George and Lady Bourke, was married to Irene, youngest daughter of Mr. and Mrs. Lewis Ashhurst, of Norwich.

Colonel Bourke was one of the early R.F.C. pilots of the pre-war period, and has served with distinction throughout the war. All who have served with him will wish him and his bride long life and happiness.

BROADBERRY — GRIGGS.—On the 2nd inst., at St. George's, Hanover Square, by the Rev. S. T. H. Saunders, M.A., Rector of St. Helen, Bishopsgate, Capt. Edric Broadberry, Essex Regt. and R.F.C., eldest son of Mr. and Mrs. A. F. Broadberry, of "Ellerslie," Buckhurst Hill, was married to Kathleen Mary, eldest daughter of Mr. and Mrs. S. J. Griggs, of "Dunelm," Loughton, Essex.

KIDDY—KYNOCH.—On July 4th, at St. Paul's Church, Finchley, by Rev. S. Bardswell Mayall, Maurice George Kiddy, Lieut. and Adjt., R.F.C., eldest son of Mr. and Mrs. J. G. Kiddy, of Finchley, was married to Dorothy Violet, elder daughter of Mr. and Mrs. John Kynoch, of North Finchley.

TOOMER—MOUNTJOY-SMITH.—On June 25th, at "The Holy Trinity," Bayswater, by the Rev. C. E. White, Lieut. Sydney Edward Toomer, R.F.C., second son of J. Toomer, of Swindon, was married to Poppy Adela Mountjoy-Smith, the only child of Mary and the late Samuel Mountjoy-Smith, of Cleveland Gardens, Lancaster Gate.

Births.

CLOGSTOUN.—On July 2nd, at The Moot, Downton, to Lt. H. P. S. Clogstoun, R.F.C., and Christabel Clogstoun—a daughter.

SOWREY.—On July 4th, at Quarry Down, Hythe, Audrey (née Adam), the wife of John Sowrey, Flight Commander, R.F.C., of a daughter.

In Memory :—Sec. Lt. W. F. Macdonald. Killed in action, June, 1917 : From his late observer A. H. Bayes, R.F.C.

Lieut. Dermot O'Neil Driscoll, R.W.F., attd. R.F.C., has been injured in an aeroplane accident. He is the second son of Col. D. P. Driscoll, D.S.O., Royal Fusiliers.

* * *

The Rev. Herbert Stead, Warden of the Browning Settlement, Walworth Road, has received information that his son, Lt. G. C. Stead, R.F.C., is a prisoner of war, unwounded.

* * *

Lt. A. M. Sutherland, a Flying Officer, and son of the Sheriff of Newcastle, writes from Karlsruhe, stating that after his fight the German officer whom he engaged sent a message thanking him "for one of the best fights I ever had in the air."

* * *

It is reported that regimental trumpet calls have been approved for the Royal Flying Corps. Presumably the "leit-motif" will be founded on the noise made by a misfiring mono.

FRANCE.

Official Communiqués.

July 5th.—An enemy aeroplane struck by our machine-gun fire fell north-west of Moronvilliers.

July 7th.—During the period from June 21st to June 30th, 19 enemy aeroplanes and a captive balloon were brought down by our aeroplanes. In addition, 14 German machines which were seriously damaged fell into their own lines. During the bombardment operations carried out during the same period the railway stations of Récicourt (Argonne) and Avricourt (between Nancy and Strassburg) and the enemy establishments in the region of Beine (east of Reims) and of the Suippe Valley were bombed

Last night enemy aeroplanes dropped several bombs in the region of Epernay and in the region south of Nancy.

During the bombardment carried out yesterday by enemy aeroplanes in the region of Nancy several bombs fell on a hospital. Three persons were killed, including a child, and four were also wounded at Epernay.

During the night of July 6th-7th our bombarding aeroplanes carried out in particularly brilliant conditions a series of aerial expeditions. 84 machines, whose crews rivalled one another in endurance and skill, took the air in the course of these operations

Some of these raids had for their objectives towns situated far in the interior of the enemy territory in reprisal for the bombardments carried out by the Germans on our open towns. The following are the details.

Between 12.15 a.m. and 1.10 a.m. 11 of our aeroplanes flew over Trêves, on which they rained over 2½ tons of shells. Seven fires were observed in the town, one of great violence being at the central station.

About the same time six machines bombarded Ludwigshafen, causing great damage. Among others, buildings belonging to the great Badische Anilin factory were set on fire.

Another of our aeroplanes piloted by Sergeant-Major Gallois flew as far as Essen, and threw projectiles on buildings of the Krupp works. Leaving at 9.20 p.m. Sergeant-Major Gallois returned at 4.15 a.m., having travelled about 440 miles.

Military establishments in the environs of Coblentz, the station of Hirson (north-east of Laon), the railway west of Phalsburg, and the station of Thionville (north of Metz) were also bombarded.

Another series of operations took place above the enemy lines and gave excellent results. A fire broke out in the station of Dun-sur-Meuse. A munitions depot blew up at Bantheville (north-west of Verdun). The station of Machault (23 miles east-north-east of Reims) and establishments at Cauroy were set on fire.

Altogether our machines dropped 13,455 kilogrammes (about 13⅕ tons of bombs). Two of our machines did not return.

Army of the Orient.—British aviators successfully bombarded the stations of Porna and Angista (20 kilometres east of Seres).

* * *

A report from Headquarters of the French Army, dated July 8th, says, apropos the bombardment of Essen by Sergeant Aviator Maxime Gallois on Friday night :—

Gallois this afternoon told the story of his flight :—"We started," he said, "at 9.20 p.m. There were four of us bound for Essen, but the night was foggy, and I soon lost sight of the others. My course lay down the Moselle to Coblenz. I was fired at crossing the line by French batteries. Over Metz searchlights were playing, but I passed undetected. I continued steering by compass to Trèves, where I heard my own comrades bombing the town. Then I picked up the Rhine with the moon shining on it, and flew up-stream past Bonn and Cologne to Dusseldorf. Looking down on the German towns was like looking down on a sea of electric light. I was several times fired at by anti-aircraft guns, especially at Cologne, where the shooting was uncommonly good. Over Westphalia the blaze of light below me grew constantly brighter. As I approached Essen there was a broad band of light on the horizon, which seemed to be several miles long, while southward of the town was another great belt of light from the iron and steel foundries.

"I arrived over Essen at a height of 6,500 ft. to avoid the air defences. I chose the spot where the blaze of light from the factories seemed brightest, and there threw my cargo of bombs, counting ten between each bomb and the next. It is impossible to say what effect the bombs had among the blazing factory chimneys below. I then started homewards, returning by the route by which I had gone. I was frequently fired at, but my machine worked perfectly, and I managed to reach home just as my petrol was running out."

GERMANY.

Official Communiqués.

July 3rd.—Six enemy aeroplanes were shot down, one of them by Cavalry-Captain Baron von Richthofen.

July 5th.—Yesterday morning one of our aeroplane squadrons attacked the military establishments and coastal works near Harwich, on the east coast of England.

In spite of the strong defence from the earth and by English aerial forces we succeeded in dropping several thousands of kilograms of bombs on the objectives and in observing the good effects thereof.

All our aeroplanes have returned undamaged.

July 7th.—The aerial activity was very lively throughout the day and night. Three enemy aeroplanes and one captive balloon were brought down.

July 8th.—On the night of July 6th-7th, in addition to bomb dropping near the front, there were encounters on German territory. Enemy aviators dropped in all over 100 incendiary bombs in the Westphalian industrial region, in Trier (Treves—near the

EDUCATING THE NEUTRAL.—A map circulated in neutral countries by the German Propagandist Office, illustrating the spots at which the Germans claim to have brought down aircraft of the Allies during the fighting round Arras from March 1st to April 15th.

Luxemberg frontier) and the neighbourhood, and also on Mannheim, Ludwigshafen, and Rodalben.

There was no military damage caused. One of the enemy aeroplanes fell into our hands.

In aerial encounters and through anti-aircraft fire at the front the enemy yesterday lost nine aeroplanes. One of these was shot down by Lt. Wolff, who thereby attains his thirty-third aerial victory.

On the morning of July 7th one of our aviation squadrons attacked London. At about 11 a.m. bombs were freely dropped on the docks, harbour works, and warehouses on the Thames. Fires and explosions were observed. One of the English aeroplanes which went up in defence was shot down over London.

Also at Margate, on the east coast of England, bombs were dropped. Our aeroplanes all returned excepting one, which was compelled to make a descent in the sea, and could not be saved by our naval forces.

JULY 9th.—Enemy aviators on the night of July 6th-7th undertook numerous attacks on the German homeland. The result of the attacks, which were undertaken with strong forces, was nil, and no works of the armament industry nor any other military works were hit.

As far as could be judged from the bombs dropped and the noise of the aeroplanes, the attacks were directed upon factories at Mannheim and Ludwigshafen and in the Saar district. All the bombs were dropped in a wide circle around their presumed objectives. One or two aviators extended their voyage to the Ruhr district. Near Essen, in spite of an assiduous search during the day, only two bomb-holes were found. Six other bombs smashed some window-panes in a village 25 miles distant from Essen.

A number of enemy aviators apparently lost their way, because numerous bombs fell in districts where no objective was apparent, as, for instance, on the peaceful villages of Speicher, Ehrang, and Oberemmel, where a child fell a victim to the attack. At the town of Neunkirchen (north-east of Saarbruck), which is militarily of complete unimportance, a man was killed and a woman was severely and a child slightly wounded. In the suburb of Diedenhofen (north of Metz) a bomb killed a family of three. At Trèves the roof of the Franciscan monastery was set on fire by a bomb. Beyond that, apart from broken window-panes, nowhere was material or personal damage done.

One of the aviators who attacked Trèves was forced to the ground by our anti-aircraft guns. Near Saarburg, on the Saar, an aeroplane was smashed, one of the occupants, who was wounded, being made prisoner.

For what reason the open and from a military point of view completely unimportant town of Trèves was again bombed is incomprehensible.

* * *

A Berlin semi-official telegram (Amsterdam, July 9th) says that the German air squadron which raided London on July 7th was under the command of Captain Kleine. The telegram claims that Charing Cross Station was hit several times, and also that London Bridge was struck by a bomb.

* * *

Lieut. of the Reserve Hans Gutermuth has been killed in a fight with a Caudron biplane after 30 months' active service since August, 1914, mostly as fighting aviator. From Nuremberg is reported of Feldwebel Johann Schrott on leave there that in a fight with a French battleplane with his machine-gun he killed Lenoir, one of the French "Aces" with 16 victories over German aircraft. Further aviation casualties include Vizefeldwebel Sebastian Festner, belonging to and the first to fall of the Richthofen squadron; it was he who forced Lieut. Robinson to land on a meadow by Douai by hitting his motor over the German lines.

* * *

A report from the "Frankfurter Zeitung" says:—Before the 3,500 American machines and 6,000 aviators are ready at the front a good number of months may be expected to pass, and our German Air Service has time enough to prepare its defence against this enemy also. In material resources the Entente was already superior, but the superiority of warlike achievement in the air is nevertheless indisputably on the German side, and we are all confident that this position will not be altered by the entry of the Americans.

RUSSIA.

OFFICIAL COMMUNIQUÉS.

JULY 6th.—In the direction of Kovel, in the region of Gradiska, our artillery brought down a German aeroplane. The machine was smashed, and the aviators were killed.

In the Carpathians the German artillery brought down one of our aeroplanes, which fell in flames in the enemy's territory. The French pilot Lignaque and the observer, Lieut. Dobrinevsky, were evidently killed.

JULY 6th.—THE BALTIC.—On July 3rd nine enemy aeroplanes executed two flights over the southern extremity of the island of Oesel (north of the Gulf of Riga). Twenty-four bombs were dropped on the batteries, airsheds, and buildings. The enemy's attacks were diverted by the concentrated fire of our naval units and shore batteries, which prevented the bombs from hitting their mark. There is no loss or damage.

JULY 7th.—AVIATION.—In the direction of Balovitch, in the region south-west of Svodtitch, one of our observation balloons was set on fire by a German aeroplane. An enemy machine was brought down here by machine-gun fire. The German aviators perished. A German battleplane in the region of the village Bartonishki (on the river Berezina) brought down one of our aeroplanes. The aviators, Lieut. Trotsky and N.C.O. Savateyeff, perished.

BALTIC SEA.—On July 6th a squadron of enemy seaplanes conducted a flight in the region Tserelian, the Island of Osel, and the town of Arensburg. Nineteen bombs were dropped on the batteries, hangars, and other structures All the bombs missed their mark and no damage was done. The enemy machines disappeared on being met by the fire of our warships and naval batteries.

BLACK SEA.—On the night of July 5th three of our fastest cutters made a raid in the Lake Razin (south of the mouth of the Danube). Having made a landing under fire, the crew captured a machine-gun and the breech of a field-gun, and took two Bulgarian soldiers prisoners, after having bayoneted twelve others. On returning the cutters were subjected to an attack by a seaplane in the Dranoff Canal.

JULY 8th.—AVIATION.—In the region of Presovce a German aeroplane was brought down.

JULY 9th.—Our aviators dropped bombs on the railway station of the town of Pinsk, causing conflagrations. A squadron of German aeroplanes made a nocturnal flight over Dvinsk and dropped a large number (several tons) of bombs.

On June 28th a German Zeppelin dropped 12 bombs on the town of Venden (on the Petrograd railway, 50 miles from Riga).

A German aeroplane dropped a note, from which it is evident that one of our machines, which was lost on June 28th, fell in the rear of the German positions, and that the dead aviators, Second Capt. Vudzilovich and N.C.O. Kalinoff, were buried by the Germans with military honours.

ITALY.

OFFICIAL COMMUNIQUÉS.

JULY 8th.—One of our big raiding squadrons, accompanied by chasing planes, went yesterday afternoon to Idria (25 miles west-north-west of Gorizia), and dropped two and a half tons of explosives on the military mercury extracting works, causing damage and fire. All our aviators returned safely.

On the Carso, during air fights, two enemy machines were brought down in our lines, while a third fell within its own lines.

JULY 9th.—ALBANIAN FRONT.—On the evening of the 7th another enemy air raid was repulsed by our fire. The numerous bombs dropped by the enemy did no damage, and there were no victims.

* * *

Details of the raid by Italian aviators at Idria on July 7th show that the mineral works there, from which the Central Empires extract all the mercury they need for explosives, were much damaged. Twelve bombers, accompanied by chasing planes, took part in the action. The central power-station and an F-shaped building to the north-east were destroyed. Several fires were observed to break out.

* * *

Reuter's Agency reports from Italian Headquarters that on July 8th three enemy aeroplanes were brought down, the first by Captain Baracca (his thirteenth), the second by Sec. Lieut. Sambonet, the third by Sergeant Rizzotto. The first of these was probably hit in its bomb magazine, for this exploded and wrecked the machine.

* * *

On the night of June 30th an Italian air raid was made on Trieste in reprisal for the Austrian air attack on Venice, and on Monday night an Italian seaplane dropped notices on Trieste explaining the reason of the raid.

BELGIUM.

OFFICIAL COMMUNIQUÉS.

JULY 3rd.—An enemy aeroplane was brought down by our artillery between Dixmude and Keyem.

JULY 8th.—Our aviators have displayed very great activity. On July 3rd three enemy aeroplanes were brought down, two of them by Adjutant Thieffry, in less than two minutes, thus accomplishing the first Belgian "double event." An enemy machine was also brought down by our special guns.

* * *

It is reported that on July 4th a Zeppelin and an aeroplane collided over Ghent aerodrome. The aeroplane was destroyed and fell, the two aviators being killed. The Zeppelin was damaged and one propeller was broken.

HOLLAND.

The Ministry for Foreign Affairs announced on July 3rd that the British Government had declared its readiness to hold an

investigation into the question as to whether the bombs dropped at Zierikzee in April last were dropped by a British aeroplane.

The Dutch Government offered to submit bomb fragments found at Zierikzee, and asked the British Government to investigate the matter. The latter replied that it had no objection, and therefore Colonel-Lieutenant C. van Tuinen, of the General Staff, will proceed to England to attend the investigation.

The Belgian and French Governments, in reply to the question of the Dutch Government whether it was possible that the incident at Zierikzee could be attributed to a Belgian or French aeroplane, stated that a thorough investigation has shown that this was not possible.

U.S.A.

JULY 4th.—The War Department has transmitted the draft of the Government's Aviation Bill to the House of Representatives' Military Committee. The measure provides for the immediate construction of 22,625 aeroplanes, for which a vote of 639,000,000 dols. is asked.

* * *

It is reported that a Bill has been introduced by Mr. Dent in the House of Representatives which has for its object the formation of a corps of 75,000 trained aviators.

Another measure to be presented later will ask the House to appropriate £120,000,000 to provide sufficient machines.

[Why not make it 7,500,000 aviators while they are at it? 75,000 aviators would need at least 200,000 machines, which, at £1,000 apiece, would cost £200,000,000, so the £120,000,000 seems inadequate.—Ed.]

* * *

Brigadier-General Squier, Chief Signal Officer, together with other experts, appeared before the House of Representatives' Military Committee on July 9th to urge the speedy message of the Bill providing for the War Department's great aviation programme for the construction of 22,625 aeroplanes. General Squier explained that these would cost £72,600,000, while in addition to that sum over £40,000,000 more would be required to man the fleet and provide ammunition and supplies.

Mr. Daniels asked Congress for £9,000,000 for Navy aviation, in addition to the amount provided in the regular Naval Appropriation Bill.

* * *

It is reported from San Diego, California, that plans for an aerial fire fighting unit, believed to be the first of its kind in the world, are announced by the local fire department. It is alleged that arrangements are being made for two 100-h.p. flying boats to be in readiness to convey firemen provided with chemical extinguishers. The story is less wild than most of those about aviation produced by the American Press.

CHINA.

A report from Pekin dated July 7th says:—

The Emperor has abdicated.

At 11 o'clock this morning an aeroplane visited Pekin, flying at a great height. It dropped three bombs on the Forbidden City, killing a man and damaging some buildings near General Chang Hsun's headquarters, which were probably the objective.

General Chang Hsun, who is much depressed by the bombing of the Palace and the failure of his coup, has tendered his resignation to the Emperor. The latter is issuing an Edict announcing his abdication.

[Fairly useful bombs, those.—Ed.]

PRISONERS IN GERMANY.

As a rule, R.F.C. officers, who are prisoners in Germany, have been so well treated that the two following letters to the "Times" deserve particular attention:—

Sir,—Your readers will have noticed that a Commission is sitting in Holland, at The Hague, to deal with the different delicate questions concerning the treatment of prisoners of war. I am afraid they are not aware, however, of the scandalous treatment meted out to many of our officers and men in Germany.

It seems to me that it suffices for a German officer to write home making the slightest complaint on his treatment in England, for the German authorities to immediately seize the opportunity as a pretext to inflict what they are pleased to term "reprisals" on those of our own officers and men whom they hold as prisoners.

The eldest of my three sons, Lieutenant G. S. M. Insall, V.C., R.F.C., who has been a prisoner in Germany since December, 1915, wrote me from Crefeld on April 28th last, to say that he had just been removed to a cell, approximately 6 ft. by 9 ft. in size, with a small window fitted with an apparatus to shut out all light, but which at the time he wrote had not been brought into use. One hour's walk a day in a small yard shut in on all sides was the only exercise allowed him. He was sentenced to solitary confinement for 20 days with the door of the cell unlocked, to be followed by five months with the door kept locked. Seven other British officers were undergoing the same sentence, and my son had been instructed to tell me that this was a "re-

PRISONERS IN GERMANY.—A group of R.F.C. Officers a nd (presumably) their Observers, in the Offiziers Gefangenenlager at Karlsruhe.

prisal" for supposed similar treatment to German officers in England. His letters reached me on May 29th.

The German authorities were well aware that no protest could possibly be made before these officers had undergone a considerable part of their sentence.

This is the sort of thing our Minister in Holland has to contend with, when instructed to inquire into and protest against the measures adopted by the Germans towards some of our sons who have had the misfortune to fall into their hands. Without the slightest doubt his task would be materially facilitated were he strongly backed up by public opinion. The case of my son and his seven comrades is not an isolated one.

Will not the relatives of other prisoners having cognisance of similar so-called "reprisals" join in strengthening the hands of those in charge of the interests of our officers and men in Germany, by letting it be clearly felt that the British public is wholeheartedly with them in whatever measures they may decide upon, and uninfluenced by the vapourings of those who, not having felt the sting of the war, object to reprisals?

Yours faithfully,

GILBERT J. INSALL.

1, rue Blanche, square de la Trinité, Paris, June 28th.

Sir,—I have been deeply interested in a letter in your issue of the 3rd inst., from Mr. Gilbert J. Insall, in which is revealed the outrageous treatment his son, Lieutenant G. S. M. Insall, V.C., R.F.C., is receiving in Germany as reprisals. I, too, have a son, Lieutenant G. C. Formilli, R.G.A., attached R.F.C., who has been a prisoner in Germany for 18 months. Early in March this year he attempted to escape with a brother officer, Captain Somerville, of the Warwicks, but both were captured, and put into solitary confinement in cells. After remaining there five weeks my son wrote on April 10th (this letter took over six weeks reaching me) saying that he had just been informed, without any previous warning, that as there was a reprisal on he would have to do five months' solitary confinement. This applied to all English prisoners who tried to escape since February. This five months was not to count as punishment for attempted escape, but merely as a reprisal. A short time ago I received another letter from my son, dated May 8th, in which he says that he and Captain Somerville had been given on the previous day their court martial. My son was sentenced to two months' imprisonment in a fortress, and Captain Somerville to three months. This punishment is to follow on the five months' reprisals. My son very naturally asks that these matters should be looked into at home. I fear the British public is very little alive to the terrible treatment that some of the British prisoners are getting in Germany. As suggested by your correspondent, I for one should be so glad to join in any effort that could be made for strengthening the hands of those in charge of the interests of our officers and men in Germany in any measures they may decide upon. It seems to me it would be only common justice if an equal number of Hun officers in English camps should receive a similar taste of the joy of living for five consecutive months alone in a cell, approximately 6 ft. by 9 ft., as reprisals. Yours faithfully,

A. E. FORMILLI.

6, Tregunter Road, The Boltons, S.W.10, July 4th.

[Certainly, this state of affairs needs investigation. It would be well if the German Government's reason for such "reprisals" were published in this country, and a denial of the said reason should be given. The fact that these officers were allowed, or encouraged, to write home about their fate, shows that Germany desires publicity to be given to the facts of the case, and it is up to the British Government to explain the circumstances, and deny the charges which have led to these "reprisals."

Curiously enough, some months ago, another officer in Germany wrote and said that he and his fellow prisoners were condemned to be closely confined in a similar manner, but that owing to the goodwill of the Governor of their Gefangenenlager they were allowed out of their cells "on leave" for 24 hours a day seven days a week. Therefore, it seems well that the whole business should be officially brought to light.—C. G. G.]

AIR RAID REPRISALS.

The following letter has been received:—

SIR,—Allow me to thank you for the article on this subject by your military contributor "Berkeley."

"Berkeley," of course, like almost all authorities on War and on International Law, condemns reprisals in general as being unjust, futile, and merely leading to greater atrocities and lasting bitterness. This opinion has been held for 2,000 years at least. I cannot see that the fact that atrocities committed from the air have been made a leading feature in the German General Staff's methods of waging war alter the general principle in any way. Of course I do not assert that all reprisals are to be condemned.

Reprisals carried out at the time on the actual infringers of war rules or later upon the real authors, the rulers, war lords, or military authorities responsible, fulfil the essential conditions which should govern reprisals. These are justice, usefulness, and a strong deterrent against a repetition of the offence.

I have, as you know, a very strong interest in our great and noble Air Service, and I hate to think of it as being employed in imitating the mean, petty, and blackguardly methods of the Germans.

There is sure to be a great outcry after this last very successful child-murder attack on East London, and I look to THE AEROPLANE and its Editor to stem the demand for reprisals in kind. If this demand is acceded to, we shall be doing what it is the great object in war not to do, i.e., we *shall be doing what the enemy wants us to do.*

I do not mean that the people of Germany desire to be murdered from the air. The Germans are at present in the grip of a "Frankenstein" of their own creation, and this "Frankenstein" wants at any cost to distract us from our far too successful legitimate warfare against his fighting "cannon fodder" at and behind his front.

Allow me to introduce a parable from the pages of "Punch" of many years ago. A country boy is represented as thrashing a number of goslings with a switch. On being remonstrated with, he says: "What for goschicks' feyther boit oi?"

This expresses the whole irrational stupidity of the kind of reprisals demanded.

What does "Goschicks' feyther" or Germany's "Frankenstein" care what happens to the "goschicks"? All the better if they are hurt a bit. They will attribute their woes not to the real origin, but to the immediate inflictor of the hurt.

"Berkeley" somewhat mildly, I consider, styles the murder by the German authorities of doctors and nurses on hospital ships as "an unmilitary act." This is certainly true, but the chief runners of the German war machine are not military men in the usual sense. These would probably describe themselves as "scientific men" and "philosophers."

Andrew Carnegie (whom I cannot say I much admire) is a shrewd old man, and speaking in America recently he said: "Has it not occurred to anyone that those Germans who order the cruel 'reprisals' are old, fat men sitting quietly in comfortable offices?"

A peculiarity of a "philosopher" and "scientific" (?) man of this kind is that he is able to steel his mind completely against the suffering of other people or animals. Stick even a pin into his own body, however, and his philosophy or science usually fails him completely.

A certain brilliant but shallow writer of plays and paradoxes, described by that genius for blundering phrases, Dr. Bethmann Hollweg, as "The English Poet," was recently permitted to visit the "Front." He, of course, was carefully nursed by his courteous hosts and not allowed to run into danger. He returned quite pleased with what he described as a kind of "joy-riding," made fun of the danger, inferred that the Germans were doing quite meritorious work in destroying a nation's monuments (curséd be he that removeth his neighbour's landmark).

He severely blames the people at home for exhibiting hate of "brother Boche," as he says, "The soldiers at the front do not hate, why should the non-combatants at home?"

Is he so ignorant of human nature as not to see the obvious reason? A case will show. A soldier at the front has fought the enemy straightforwardly, and does not hate him. He goes home on leave and arrives at his house to find it wrecked by a Zeppelin or aeroplane bomb, and the entrails and brains of his wife and little daughter scattered about the walls of their room. Will he not hate with an enduring hate the dastardly brutes who ordered this outrage?

Are we then to continue to suffer these things without reply?

Would not this straightforward measure be the best calculated to bring about a speedy and a lasting peace? Let all the Entente Powers draw up an indictment of the acts of the German "Frankenstein"; print this in German, and distribute it to the German army on all fronts by aeroplanes.

The indictment would further state that the Parliament of Civilisation proclaimed the members of the German High Command as outlaws. No peace would ever be negotiated with Germany so long as these men (named) remained in power.

Germany could have peace to-morrow on just, even on generous, terms were her "Frankenstein" broken up and destroyed. A fitting punishment would be death, ignominious in the case of the non-fighters.

Failing this, the slaughter must go on until another 1,500,000 is added to the 1,500,000 of Germany's best already killed.

It would be well for Germany to consider carefully and make peace before her frontiers were crossed by the peoples she has wronged.

Meanwhile let them know that in America, Britain, France, and the others, vast new armies, munitions, and aeroplanes are being hurried forward to assist the spiritual superiority held from the first by the Allied Entente in crushing the material so long possessed by the Central Empires and their allies.

At home we can best make reprisal by pushing on with more and more aeroplanes and pilots, and harrying constantly all the German raiding nests within accessible distance of our bases.

(Signed) ANDREW SCOTT.

OUR MAN POWER.

One of the most amusing examples of our method of using our man-power came to light the other day. Three very respectable men reported for duty to a certain officer recently, in response to a request to the depôt for servants for the officers' mess. Seeing that they were above the ordinary class of servant, the officer asked them what they were before they joined.

Two said that they were chartered accountants and the other said that he was a commercial traveller.

They were taken off to the mess steward, who said to one of the accountants, "D'you know anything about silver?" "Well," replied the man, "I have collected antique silver as a hobby for some years, so I suppose I do." "Good!" said the mess steward; "then your job will be to polish the mess plate."

The notion of turning on a qualified accountant to polish forks and spoons for young officers—to some of whom he would probably have refused to pay 10s. a week as office boys before the war—is not without humour, especially when one knows the trouble certain Government offices have in keeping their books even moderately accurate and up to date owing to the shortage of trained book-keepers. Likewise the idea of a trained business man folding napkins for temporary gentlemen, who may or may not know how to use them, is quite funny when one sees the curious ideas of business methods demonstrated by some of our purchasing departments.

Really it is time a special Department was formed for the purpose of "combing out" the Navy and Army, and putting men into the jobs which they can do most efficiently. One still believes in the theory that if one does ever discover a man in the particular job for which he is most suited, one is safe to bet that he was given the job on account of some supposed qualification which he does not possess.

CAPTAIN WINDHAM REDIVIVUS.

Those who remember the merry days of the infancy of aviation, when anyone who had ever sat in an aeroplane could pose as an "expert," will be interested to learn that "Captain Windham," who ceased to be prominent in aeronautical affairs after the decease of the "Aeroplane Club," is again appearing in the public limelight—albeit suburban rather than imperial.

An article in a paper called the "Hackney Spectator" announces to the extent of two columns that "Captain Windham has accepted the invitation to become the prospective Unionist candidate for the constituency." The article relates the career of this gentleman in "the Royal Navy, Merchant Service, Royal Indian Marine, Royal Naval Light Infantry (*sic*), and as a King's Messenger," but, curiously enough, it does not say how he attained to the title of "Captain Windham, R.N."

So far as the article goes, it says that "at an early age he entered the Merchant Service." One gathers, furthermore, that he was a lieutenant in the Royal Indian Marine, which is not, strictly speaking, R.N. One understands, however, that the rank of Captain was held by Mr. Windham when serving in the Army Motor Volunteer Corps. since disbanded, but there appears to be some error in combining the rank of Captain in a disbanded volunteer corps with the rank of lieutenant in the Indian Marine, and producing "Captain, R.N.," as a result. Doubtless the editor of the "Hackney Spectator" has omitted to study the subject of Service ranks and precedence.

As regards Mr. Windham's variegated aeronautical career, the "Hackney Spectator" tells the following tale:—

"In addition to serving in the many capacities enumerated above, Captain Windham has also made a profound and successful study of several commercial and scientific problems which are to-day proving their value and merit. He was, for instance, the founder of the Aeroplane Club, an institution which had incalculable influence upon the promotion of the best interests of aviation in this country. He was the first to arrange flights to the French aerodromes, promoted exhibitions, flying competitions, and in order to encourage flying gave many prizes, including the Gold Cup, which was won by Mons. Blériot for the first cross-Channel flight. It may therefore truly be said that the prospective Unionist candidate for Central Hackney was one of the pioneers of the cordial goodwill which to-day exists between this country and our French Allies. His work on behalf of aviation extended far away beyond the confines of England and France.

"Recognising the vast potentialities of the aeroplane, he in 1910 imported the first flying machine into India. This was used under his direction for educational purposes. He also organised the flights in connection with the Government Exhibition at Allahabad, and Captain Windham was granted special permission to institute and organise the first aerial posts. His amazing daring exploits in this direction proved so highly successful that he was authorised to arrange, and was in charge of, the special series of aerial post deliveries between Hendon and Windsor in 1911.

"The world-wide interest aroused in this bold scheme will be recalled, and it is pleasing to record the fact that as a result of the deliveries a large sum of money, running into many thousands of pounds, was handed over to the King Edward Hospital Fund—the special sum of £500 being handed to the aviator, Mons. Hubert, who was injured whilst conveying the mails."

Quite apart from the fact that neither M. Blériot nor M. Hubert has taken Holy Orders, and so has not attained to the ecclesiastical title of Monseigneur, the account will be highly entertaining to all those who remember the Aeroplane Club, and the Indian exhibitions, not to mention the "aerial post" business. At any rate, Mr. Windham's gift of persuasive eloquence should stand him in good stead in his political efforts.

A CHEERFUL GATHERING.

On Saturday evening the firm of William Cole and Sons, Ltd., held their annual dinner at the Pillar Hall, Victoria Station, S.W. There were present some 150 employees and guests, and the dinner was followed by a very pleasant musical evening, and everyone present spent a very enjoyable time, despite or perhaps because of the air raid in the morning.

The firm of Cole is not of the mushroom type, as it existed long before the war as a motor coach building establishment, as which it enjoyed a high reputation; and Mr. Cole very early in the war turned his attention to the building of aircraft, making a modest beginning in the basement of his premises at 235, Hammersmith Road. To-day the whole energies of his staff are devoted to the building of aircraft, and one sincerely hopes that the success which has attended the firm's efforts so far will continue in the future, and that eventually the firm will become as famous for the building of high class aircraft as it has been in the past as builders of high grade motor coach work.

ANOTHER EXHIBITION ACCIDENT.

During a review of babies in the People's Park, Grimsby, on July 5th, in connection with the National Baby Week, an aeroplane, which had been dropping pamphlets, alighted in a field close by, causing a crowd to assemble. A second aeroplane, which was descending, in trying to avoid the people, collided with a hedge and knocked down a woman named Simpson, seriously injuring a two-year-old child in her care.

FALKLAND ISLANDS' WAR GIFTS.

The Legislative Council of the Falkland Islands has presented the Imperial Government with an armed aeroplane for the Royal Flying Corps.

ANSWERS TO CORRESPONDENTS.

On account of the labour involved in replying to questions from correspondents, many of which in the past have been answered over and over again by post, it has been decided to answer inquiries of general interest in the columns of The Aeroplane. *Inquiries should be addressed to The Editor, 166, Piccadilly, W.*

Readers by the Hundred.—If you want any information about joining the R.F.C., write to the Director-General of Military Aeronautics, The Air Board, Strand, W.C.

If you want any information about joining the R.N.A.S., write to the Director of the Air Services, The Air Board, W.C.

Men in the Army, and ratings in the Navy can only obtain commissions in their own branches or transfers to other branches by permission of their immediate commanding officers, who must forward those applications through the proper official channels.

Civilian applicants for commissions in the R.F.C enter through the Cadet Wings, and are trained to fly at the Government's expense.

Applicants for commissions in the R.N.A.S. enter as Probationary Flight Officers, and are trained at Government expense.

If you are blind or partially blind, or have to wear glasses for any serious reason, you cannot become a Naval or Military aviator.

If you have had special technical training, are over 35 years of age, and attain the necessary social standard, which is not high, you may with luck become a Stores Officer R.N.A.S., or an Equipment Officer R.F.C., even if your sight is defective and you are physically deficient in other respects.

Information concerning appointments as viewers or examiners or inspectors in the Aeronautical Inspections Department may be obtained from the Chief Inspector, A.I.D., Air Board Office, Strand, W.C.

Observation of the points indicated above will save a great deal of unnecessary correspondence at the Admiralty, at the War Office, and at this office, as there is no need to write letters on any point already explained above. The Editor is always pleased to answer questions or explain any points not understood by readers, but space in The Aeroplane is valuable, and the same question cannot be answered over and over again week after week. Consequently readers are requested to make quite sure that their questions have not already been answered recently.

G. F. S. (Plymouth).—There is no book specially devoted to seaplanes. "The Aeroplane Speaks," by Captain H. Barber, price 7s., post free, would give you some useful general information on aviation, and it deals very soundly with the principles of flying.

P. de R. (St. Leonards-on-Sea).—It is quite a common thing for both German and Allied aeroplanes to use machine-guns which fire through the propeller. I take it this is what you mean by firing through the fuselage. Synchronising gear is now employed to prevent the bullets striking the propeller. If you look through your back numbers and read the article about the Albatros D.1. scout, you will find they use the machine-gun in this manner, and the arrangement of the gun can be seen in the drawings. The advantage of placing the gun in this position is that it allows the pilot to aim at his adversary without altering the position of the gun, and he need only steer his aeroplane straight for the enemy. Naturally he has to turn off at the last moment.

It is difficult to name an average of normal wind velocity, but modern aeroplanes can fly in almost any wind. The presence of a powerful gusty wind only makes landing and starting more difficult.

The use of a silencer is to silence an engine. Its chief function is merely to reduce the noise. A silencer is a more or less elaborate fitting to prevent the exhaust gases from the engine impinging directly upon the open air. A properly designed silencer with a capacity of four or five times the cylinder capacity of the engine will almost completely silence the explosions. It is almost impossible, however, to silence a powerful aeroplane entirely, because the blast from the propeller makes nearly as much noise as the engine. This is a point which quite a number of people fail to realise.

The French Astra biplane figured in the French Military Trials of 1912. It was an extremely clever production for its day.

To stall a machine is to fly it in such a way that it loses its flying speed, in which event the machine is bound to fall until it picks up the original speed. Stalling is usually the result of an attempt to climb too quickly.

A spin is a phenomenon in flying where a machine is following a downward spiral course of small diameter, and where the tail is not following the same path as the nose. Experienced pilots can throw a machine into a spin and can also pull it out.

S. G., London, N.W.10.—A useful book on propeller design has been produced by Mr. M. A. S. Riach, the price of which is 10s. 6d. Copies may be obtained from the William Dawson Publishing Co., Ltd., Rolls House, Breams Buildings, E.C.4. An article on propeller manufacture appeared in a recent issue of The Aeroplane.

W. E. W. (Shorncliffe).—The best books for a candidate for the R.F.C. to read are "The Aeroplane Speaks," by Captain H. Barber, price 7s., post free, and "Aeronautical Engines," by F. J. Kean, price 6s. These can be obtained from the William Dawson Publishing Co., Ltd., Rolls House, Breams Buildings, E.C.4.

J. C. L. (Winchester).—All particulars available of the Detroit Gas Turbines were published in The Aeroplane of June 28th, 1916. Nothing further has been heard of its performances of late, and it has come to be regarded merely as a very interesting experiment. So far as is generally known no such gas turbines are actually in use.

C. R. W. (Cheetham Hill, Manchester).—As regards the competition held in France in 1912 which was organised by the Peugeot Co. for man-driven aeroplanes, it very successfully demonstrated how very far away was everything approaching to unaided flight.

The prize was not won by Paulhan, as you suggest, but by a trick cyclist, and the "flight" so-called was nothing of the kind, the machine used being a bicycle, with a pair of wings about 18 in. long and a few inches deep, which were simply placed on the machine in order to qualify it.

As the distance to be traversed was only 1 metre, and the altitude was a few centimetres, it was quite easy for this cyclist to hurl his machine off the ground by an acrobatic contortion, which anyone who is really clever with a bicycle can perform to a greater or lesser extent.

The machine which won the prize did not even have a propeller on it, but had the usual arrangement of pedals and cranks which operate the rear wheel.

Flying has been done upon low-powered aeroplanes by several people, notably by Mr. A. V. Roe on a 10-12 h.p. biplane, by the Wright brothers on a 12-h.p. biplane, and by the late Edouard Nieuport on a 14-h.p. monoplane.

There is no doubt that low-powered aeroplanes will be tried at the cessation of hostilities for purposes of sport, but it is hardly likely to be popular, because the smaller the aeroplane the greater the risk to the pilot in the event of a smash.

L. P. C. (Felixstowe).—You are quite right in stating that there was a 14-cylinder Gnôme engine of 100 h.p. This engine was used to quite a fair extent in both land and sea-planes, some of the early Avro Admiralty machines being fitted with it. Mr. Grahame-White won the 1910 Gordon-Bennett race with a Blériot monoplane fitted with this engine.

It was practically two 50-h.p. 7-cylinder Gnômes built up together on a single crankshaft and crankcase, the cylinders being disposed in two rows of seven. The chief weakness of the engine lay in its bearings and in the impossibility of getting an even mixture to the two rows of cylinders, because if one admitted sufficient gas to reach the second row the mixture received by the rear row was much too rich, and serious overheating resulted.

E. L. (High Wycombe).—A Zeppelin was brought down near Salonika on May 5th, 1916, its number being Z.85.

MISCELLANEOUS ADVERTISEMENTS.

All Advertisements for the Miscellaneous Advertisement Columns should arrive at this Office by first post on MONDAY to ensure insertion.

Special PREPAID Rate: 18 words 1/6; Situations Wanted ONLY, 18 words 1/-; 1d. per word after.

For the convenience of Advertisers, replies can be received at the office of "THE AEROPLANE," 166, Piccadilly, W.

PATENTS.

PAGE & ROWLINGSON, Chartered Patent Agents (Consulting Engineer, Mr. S. E. Page, A.M.Inst.C.E.), 27, Chancery Lane, London, W.C. Tel. 332 Central.

Henry Skerrett, Chartered Patent Agent, 24, Temple Row, Birmingham.—Patents, trade marks, and designs.

SITUATIONS VACANT.

Applications are invited for the position of foreman in Metal Fitting Department of aircraft works.

Applicants must be thoroughly conversant with all processes, and capable of quick and accurate production.

No person already on Government work will be engaged.

Apply to your nearest Employment Exchange quoting number A.3364.

About to build Flying Boats! Required experienced boat builder accustomed to this type of work. No one on Government work need apply. Applications must be made through nearest Employment Exchange, mentioning this paper and Box No. 1181.

Wanted, Aeronautical Draughtsman for factory in N.W. District of London, thoroughly experienced man, capable of working out stresses, etc. No person resident more than 10 miles away or already engaged on Government work need apply. Reply stating age, full details of experience, and salary required to Box 007, Samson Clark and Co., Ltd., 58, Great Portland Street, W.1.

Wanted for munition works—Welfare Lady, strict disciplinarian and one used to factory organisation. One hour from London. Apply Box No. 1186, THE AEROPLANE, 166, Piccadilly, W.1.

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Manager wanted for small aeroplane and engineering works near London; opportunity for financial interest. No one residing more than 10 miles away or already on Government work need apply.—Box No. 1189, THE AEROPLANE, 166, Piccadilly, W.1.

Jig and Tool Draughtsman required, aviation works, near London. Good man required. No person resident more than 10 miles away or already engaged on Government work need apply. State age, salary and experience. Write Box 550, Samson Clark and Co., Ltd., 58, Portland Street, W.1.

SITUATIONS WANTED.

Foreman Turner seeks re-engagement.; 18 years' experience; ineligible.—A. V. Ellis, 70, Aylmer Road, Shepherd's Bush, W.

Foreman Aeroplane Woodworker, Hulls, Floats, Wings. Experienced in all departments.—Box No. 1165, THE AEROPLANE, 166, Piccadilly, W.1.

Foreman of Metal Shop wants job; experienced all kinds of Wiring Plates, Axles, Axle Fairings, Skids, Exhaust Pipes, etc. Good references. Box No. 1177, THE AEROPLANE, 166, Piccadilly, W.1.

Engineer, 20 years' experience with leading engineering firms as manager, works' manager and superintendent, desires responsible post with reputable firm. Well up in manufacture of aero-engines, Gnôme, Le Rhône, Clerget, etc. Organising ability. First-class credentials. Box No. 1180, THE AEROPLANE, 166, Piccadilly, W.1.

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Aeroplane Radiators.—The Gallay Radiator Company, Limited, stock Aeroplane Radiators. For the benefit of Constructors, can supply radiators for experimental purposes at a nominal cost. Advice given on suitable types for the various approved engines. Our drawing office is always at our clients' disposal.—198, Great Portland Street, London, W.1.

Air Screws.—Several hundred, various makes and sizes; 150 cases, 250 steel bosses. State wants.—Andrew, 8, Brackenbury Road, London, W.6.

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Tapes, Webs, Cords and Threads in all qualities, suitable for Aircraft Work. Delivery from stock.—John MacLennan and Co., 30, New gate Street, London, E.C.1. (See Advertisement Page 130 and Buyers' Guide.)

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MODELS.

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An Aircraft Factory, with well-equipped Joinery Department, in the Midland Counties, is open to receive orders for Planes, Ailerons, Tail Planes, Elevators, etc. The Metal Fittings made on own works. This will ensure prompt delivery. Apply Box No. 1182, THE AEROPLANE, 166, Piccadilly, W.1.

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Edited by C. G. Grey

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The AEROPLANE

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ON AMERICAN OPTIMISM.

I wonder whether General Squier and Colonel Bennet, of the United States Army, are very great humorists, or whether they have been grievously misled by their technical advisers. One has heard of technical men misleading the innocent and honest soldier in the past. It happened in Mesopotamia in medical matters, and it happened in England in aeronautical affairs, so it is not beyond possibility that it has happened in the States. On the other hand, the aeronautical chiefs of the U.S. Army may be merely pulling the enemy's leg.

The reason for the uncertainty of opinion thus expressed is the official specification for "Military Pursuit Airplanes" issued from the Office of the Chief Signal Officer, War Department, Washington, D.C., on May 1st, 1917, and published in "Aviation," New York, of June 1st, 1917. Possibly this specification, known as "Aeronautical Specifications No. 1003," has now been followed by another embodying the enlightenment of a further two months. Anyhow, at this date it must be familiar to the Hun, seeing that there is no Censorship in the U.S.A., so there is no harm in publishing it and commenting on it.

But, as I have said on previous occasions, the worst fault of the Americans is that they are so damnably English, so quite possibly that specification, having once been issued, must stand for a given period. It would be quite in accordance with the best official tradition if it were decreed that, when once a specification has been issued, no alteration can be made therein for another six months. However, let us hope that such is not the case, and that General Squier and his Staff may have to-day ideas quite different from those which they held in April.

What We Expect.

Even so, it is worth while to deal with the specification at some length, because it indicates how much behind Europe America's aeronautic officials have been hitherto in their knowledge of war requirements. One would not worry about that but for the fact that we expect rather a lot from America in this war, and we expect more from her in the air than on the ground, because air fighting affords even greater scope for the peculiar initiative and individuality of the American than does infantry work.

Therefore it would be a real tragedy if the splendid human material which America can supply were to be wasted by being ineffectually equipped. We have seen during the first two years of the war considerably more than enough of mistakes in equipment in this country —especially in the Flying Services—and the best service one can do the cause of the Allies in general and America in particular is to endeavour to prevent our new Ally from making the mistakes which we have already made and put right.

Butcher's Meat.

Well do I remember, many years ago, at one of the great French trials, a group of aeronautical enthusiasts going from shed to shed inspecting and criticising the various machines. In one shed was a very fine pilot truing up a machine which looked all right to the inexperienced eye, and even to those with a fair amount of knowledge there was no obvious mistake in the design. But one sound French critic looked all over the machine carefully, then he turned to his friends, jerked his thumb over his shoulder towards the pilot, remarked in a low voice, "*Viande de la boucherie,*" and walked out of the shed. It was his only criticism of the machine, but he was right. Sure enough, within twenty-four hours the pilot was as dead as mutton.

Possibly, if his criticism had been more explicit and had been delivered to the maker of the machine, the pilot might not have flown it, and so might not have been killed. Therefore, instead of merely remarking that any pilot who crosses the German lines on an American aeroplane built to "Aeronautical Specifications No. 1003" is merely butcher's meat, it seems better to quote the whole specification and criticise it as one goes along. Here, then, is the published version, with comments interpolated paragraph by paragraph :—

AERONAUTICAL SPECIFICATIONS No. 1003.

Military Pursuit Airplanes.

This specification describes the design, construction, equipment and requirements of a military airplane adapted to overland flying, combat, and pursuit of hostile aircraft.

General Requirements.

The following characteristics shall be proven to the satisfaction of inspectors appointed by the Government for that purpose.

(1) This airplane shall be a one-place tractor, with one body and shall be equipped with one engine and one propeller.

(2) It shall be designed for carrying a useful load comprising the following :

(a) Pilot—seventy-four (74) kilograms.

(b) Available gasoline and oil sufficient for a flight of two and one-half hours at full power.

(c) Machine-gun or guns, ammunition, equipment and instruments—sixty (60) kilograms.

unless otherwise specified, during all performances and maneuvering tests, the machine-guns shall be mounted in place and the useful load carried shall be equivalent to the above enumerated.

The first point which strikes one here is that 2½ hours' supply of "gasoline"—Anglicé, petrol—is not enough. Fighting machines have frequently to escort bombing and reconnaissance machines on long journeys far behind the enemy's lines. And if, as would appear obviously to be the sanest policy, America is to build also a big fleet of large bombing machines for the invasion of Germany, then it is clear that any fighting machine should be fitted with tanks for at least four hours' flying, so that a journey of 150 miles out and

150 miles home may be covered with a fair margin of fuel for diversions from the direct route in pursuit of hostile aircraft.

ENGINE POWER.

(3) The power plant for which the airplane shall be designed shall be an engine of type approved by this office, of between 100 and 150 actual brake horsepower.

Here is another very grave case of under-estimation. The Germans use nothing under 160 h.p. on their modern fighting machines, and their star-turn chaser pilots use anything up to 260 h.p. on single-seaters. Manufacturers are always liable to adopt the lower rather than the higher of limits officially imposed, so that the mere mention of 100 h.p. is dangerous in any specification. To talk about 100 h.p. on a war-machine to-day is as bad as talking about using 50-h.p. Gnômes on active service would have been in 1915.

It is true that quite recently it was admitted that we were then using 90-h.p. R.A.F. engines on active service, but that is merely a punishment for our past sins, and it is for America to profit by our mistakes, not to imitate them.

UNDER-ESTIMATED SPEED.

(4) The horizontal high speed at an altitude of 3,000 meters above sea level, shall not be less than 165 kilometers per hour.

This, perhaps, bar one, is the most dangerous clause in the specification. Three thousand metres is, as near as no matter for practical purposes, 10,000 feet. One hundred and sixty-five kilometres per hour is just a shade over 100 miles an hour. Now, anyone who has met a German chaser of any of the later types in the 10,000 feet levels knows that he might as well get out and walk as try to fight it on a 100-mile-an-hour single-seater.

The notion of calling a 100-mile-an-hour machine a "pursuit airplane" would be distinctly humorous if it were not so tragic. "Pursued hare-plane" would be a better title for it.

As a matter of fact, if one cannot raise a speed superior to that of the German chasers, it would be better to have as a fighting machine a good, big, fat, slow thing carrying four or five machine-guns and only doing 90 miles an hour or so. Our own experience tells us that the big, slow machines afford better gun platforms than the light scouts, and that so long as a flight of half a dozen or so of them keeps its formation it can hammer its way through the German fighting machines. Even the star-turn "Circuses" never seem to stop and fight an action at close quarters with the Feeplane offensive patrols, but content themselves with making one dash and then clearing off. So the heavily armed fighter seems worth developing still further.

Anyhow, 100 miles an hour at 10,000 feet is perfectly useless for a single-seat fighter. And in making this statement I am not committing the crime of booming German aeroplanes, on which Colonel O'Gorman laid such stress in his excellent Wilbur Wright Memorial Lecture, I am merely stating a fact which is common knowledge in the Services, and ought to be known to all aeroplane designers all the world over.

I know perfectly well what are the defects of the German machines, but to point out their faults would be to assist the enemy, in that it would help him to improve his aeroplanes, whereas to emphasise the good points in the German machines is to encourage our own designers and those of the Allies to produce something better.

However, to return to the point, if General Squier obeys the traditional American injunction to "hitch his wagon to a star," he will talk to the American Aircraft Industry about 150 miles an hour at 10,000 feet, and then he may in the end obtain something worth having.

LANDING.

(5) Next to extremely rapid climb, a large speed range is desirable. It shall be demonstrated by landing in a calm, that the run after touching is not more than eighty meters, and that the landing speed is not so great as to render the airplane difficult to handle.

A run of 80 metres, or 250 feet, after touching is a very liberal allowance, for any really clever test pilot, such as those who will presumably put the sample machines through their tests, ought to be able to "squat" his machine at about 40 miles an hour and pull up inside 50 yards. Naturally an unskilled pilot landing at full flying speed will run for half a mile after touching on any fast machine, but a machine doing anything between 100 and 150 miles an hour ought to be able to land at between 40 and 50 if it has the right wings.

THE WORST MISTAKES.

(6) The climb shall not be less than 3,000 meters in thirteen minutes.

(7) The airplane shall be capable of attaining in less than thirty minutes (starting with the specified useful load) an altitude of five thousand (5,000) meters.

Clauses (6) and (7) are by far the worst in the whole specification, simply because climbing speed and height of "ceiling" (otherwise the maximum height the machine can reach) are actually more important than anything else in a fighting machine.

As has been said over and over again, the upper berth in the air is precisely what the "weather gauge" was in fighting with sailing ships. The top dog can attack when and where he likes. He can always obtain speed by diving, and when he has dived and delivered his attack it is of prime importance that he shall be able to regain the upper berth for a fresh attack.

Now, a 10,000 ft. climb in 13 minutes is simply not worth considering in these days, even for a two-seater. For a single-seat "pursuit airplane" it is merely ridiculous. And the machine which would take half an hour to get to 16,000 feet (which is about 5,000 metres) might just as well stay on the ground for all the use it would be in pursuing a German chaser.

If General Squier will halve his times he will be somewhere near the mark. Six and a half minutes to 10,000 and 15 minutes to 16,000 would be worth considering in a fully loaded single seater, but with only 2½ hours' fuel it would be nothing very exciting even now, judging by the best German machines.

It is most important to remember the rule laid down by one of our British prophets, and quoted in this paper some six months ago: "For the officer in charge of equipment there is no to-day. His to-day is six months ahead." Six months hence 150 miles an hour at 10,000 feet, 6½ minutes to 10,000 feet, and 16,000 feet in a quarter of an hour may quite probably be out of date, and "Aeronautical Specifications No. 1003" was six months out of date when it was published on May 1st, 1917.

GETTING OFF.

(8) The run required, in a calm, to "unstick" for flight, shall not exceed sixty-five (65) meters.

The demand that a machine shall not run more than 65 metres (say 70 yards) before getting off the ground is merely further evidence that the art of designing a machine for climbing is not understood by our esteemed Ally. I personally have seen one of our fast chasers lift clear of the ground within 20 feet of the place on which it was resting when the engine was started. The pilot never even raised the tail; she simply trailed her tail-skid a few yards and shot straight up like a helicopter. And if single-seat fighters are to be fit to go

up at a moment's warning and strafe unexpected enemy bombers or reconnaissance machines, that is how it has to be done.

STUNTS AND CONTROLS.

(9) The airworthiness and general flying qualities of the airplane shall be satisfactory. The primary characteristic desired is celerity of response to control, in other words, extreme handiness.

In order to determine the flying qualities of the airplane, an Army pilot may, at the discretion of the inspectors, after the satisfactory completion of all required performance tests, fly the airplane to determine its general suitability for the use intended.

(10) Maneuvering ability on the ground must be satisfactory. The airplane shall be capable of making reasonably sharp turns to right and left or of being driven along a straight course in any direction with respect to a moderate wind.

(11) Control system shall be of the "stick" type. The operation of the control shall be positive, reliable, mechanically easy and shall give the proper power ratio in each case. The engine throttle shall be on the right hand side. The ground wire switch shall be on the left side.

As regards clauses (9), (10), and (11), "celerity of response to controls," otherwise the ability to "chuck stunts"—in the vernacular of the flying officer—is eminently desirable, and manœuvring ability on the ground is certainly important. It will be noted that nothing is said about inherent stability. On these points most European pilots of single-seat fighters will agree with the Specification. At the same time something might have been said on the subject of fitting an auto-lock control on the "stick" in the fashion common on the D.I. type Albatros, so that a measure of inherent longitudinal stability may be given at will, thus enabling the pilot to take both his hands off the controls when he wants them free to manipulate his machine-gun.

ARMAMENT.

(12) Satisfactory provision must be made for mounting and firing one or two machine-guns (as specified in the order). No provision for training the gun with respect to the airplane, during firing, is desirable. The proposed system of mounting the machine-guns shall be submitted to the War Department for approval before installation. The machine-gun shall be of a type specified in the order. A suitable arrangement of sights shall be installed.

Here again one feels inclined to disagree. Many pilots like to be able to train a gun when firing, especially on slow machines—among which one must class the U.S. "Military Pursuit Airplane." A fixed gun, or two fixed guns with converging fire—German fashion—firing through the propeller with a synchronising gear, is or are only of use when the "Pursuit Airplane" is so much faster than its enemy as to be able to attack when and where it wills, and to be able to avoid attack by sheer speed when it loses its chosen position.

In a slow machine, which cannot thus avoid attack, a swivelling gun for defence purposes is practically a necessity. It will be noted also that nothing is said in the specification about making allowance for synchronising gear in the design of the fuselage—but doubtless this would come under the clause (3) regarding "an engine of type approved by this office" and under clause (10) regarding a gun "of a type specified in the order."

FUEL SUPPLIES.

(13) Gasoline feed to the carburetor shall be by gravity and shall be operative in all normal flight attitudes. It is highly desirable to avoid air pressure in a gasoline tank. In case it is necessary to pump from the main supply tank to the gravity tank, the pump shall be a suction pump. The main supply tank shall be divided into two gas tight compartments. Self sealing tanks are desirable.

The wisdom of clause (13) is obvious, but insistence on gas-tight compartments seems likely to put up weight, and self-sealing tanks—if ever some genius invents them—are likely to be heavier still.

STRUCTURAL DESIGN.

FACTORS OF SAFETY.—Factors of safety will be required as follows: A. Main plane and girder structure. Stress analyses using methods and moduli approved by this office must be made for the high and low speeds of the airplane. Under the low speed condition the factor of safety shall be, at no point, less than five and one-half (5½). Under the high speed condition the factor of safety shall be, at no point, less than four and one-half (4½). Computation must be based on the total weight with loading as specified above.

Not being a scientific expert, I do not profess to be able to criticise these demands, but it seems to me that if a machine has a factor of safety of 4½ all over at its top speed, it cannot very well have a factor of safety of anything like 5½ at its low speed. Even if its top speed were as low as 120 miles an hour (to say nothing of diving all out at nearly 200 m.p.h.), and if its low speed were as absurdly high as 60 miles an hour it seems to my unscientific mind that a 4½ factor at top speed ought to give a factor somewhere up in the dozens at low speed. And, contrariwise, if it only had 5½ at low speed, its safety factor would become a minus quantity at top speed. So why bother about a low speed factor of safety. Perhaps some scientific reader will explain the error in my deductions if I am wrong. It would make an interesting and educative dissertation.

B. BODY AND TAIL STRUCTURE.—Body structure forward of the cockpit shall be designed for a factor of safety of ten (10) over static loading conditions with the propeller axis horizontal. Load to be as stated in paragraph 2.

Body structure in the rear of the cockpit shall be designed to fail under loads not less than those imposed under the following conditions:

(a) Dynamic loading of five (5) as the result of quick turns in pulling out of a dive.

(b) Superposed on the above dynamic loading shall be the load which it is possible to impose upon the elevators, computed by the following formula: $L=(0.005)\ (A)\ (V^2)$. Where A is the total area of the stabilizing surfaces, i.e., elevators and fixed horizontal surface, and V is the horizontal high speed of the airplane. The units are kilograms, square meters, kilometers per hour.

(c) Superposed on this loading shall be the force in the control cables producing compression in the longerons.

C. LANDING GEAR.—The landing gear shall be designed to permit the airplane, fully loaded, to be dropped from a height of 0.25 meters on a wood floor, tires at normal inflation, without injury. The design and construction of landing gear and tail skid shall be proven satisfactory.

The body-structure stresses specified will probably take some rather nice working out, and one would like to warn American designers that in doing the calculations under sub-heads (b) and (c) they had better allow for speeds up to 200 miles an hour, because fighting pilots have a bad habit of diving with their engines full on after a descending enemy, and of doing what they call euphoniously "split-air spirals," in which gravity, full engine power, and centrifugal force are all mixed up in a hopeless tangle, which is enough to turn any slide-rule expert bald with brain-fag.

Incidentally one assumes that the adjective "split-air" originated with the idea that the speed of these manœuvres is so great that the molecules of the air hit by the machine are split into their component atoms. The phrase is not without poetic beauty of the modern kind.

Of course, there may be no need for such calculations in a slow old tank with a little 100-h.p. engine which only does 100 miles an hour, and takes half an hour to reach 16,000 feet, but it will be just as well for American designers to look ahead a bit, in case the specification is brought up to date.

CURIOUS OMISSIONS.

INSTRUMENTS.

1 Compass—Sperry—Creagh-Osborne—Latest Navy type.

1 Aneroid 15,000 ft. Taylor Instrument Company's latest type.

1 Clock—Chelsea.
1 Rotating rolling map case.
1 Revolution indicator.
Such instruments and controls as may be necessary in connection with the power unit.

George O. Squier,
Brigadier-General, C.S.O.
By: Jno. B. Bennet,
Lieut.-Col., 17th Infantry.

Office of the Chief Signal Officer,
War Department,
May 1st, 1917, Washington, D.C.

The chief peculiarity about the instrument list is the entire absence of an air-speed indicator, which is the most important thing of the lot, as it is a measure of the safety of the structure of the machine in diving and an insurance against stalling when flying slowly. It is much more important that a thoroughly reliable air-speed indicator, such as the Ogilvie or Clift, be fitted than that the compass or aneroid or revolution indicator should be accurate.

One can steer by the sun; one can see one's height and estimate it nearly enough; one's stomach is a fairly accurate clock, where meal-times are concerned; and, if the machine's flying speed is right, there is proof that the engine is giving its power, no matter what the rev. indicator may say; so evidently the air-speed indicator is the most important of the lot.

By Way of a Joke.

Of course, as has been suggested, the whole specification may be only a joke, just to persuade the enemy that when the American fighting machines come over they will be "easy meat"—as a captured German pilot once remarked scornfully as he stood in a British aerodrome and looked at the comic machines which we were then using for fighters. If so, one hopes the Hun will bite it off, and will, when the time comes, meet something a good deal better than he possesses himself.

On the other hand, the specification may be only intended for intermediate machines, of the sort onto which pilots taught to fly on the excellent 90-h.p. "JN" Curtisses will be put, so as to let them get used to a little bit of speed, and to teach them to do the aforesaid "split-air stunts," before they are promoted to fly real fighting machines such as they will have to use on active service.

But the great and most important point is that American designers, and American aviators, and American people interested in aviation should not run away with the idea that "Aeronautical Specification No. 1003" is anything at all like a "Military Pursuit Airplane adapted to combat and pursuit of hostile aircraft." And it is equally important that European readers of the Specification who, lacking the American fineness of perception, might take it seriously, should not be plunged into an abyss of disappointment by the idea that, after all they have read in the American Press about America's Air Fleet, this is the kind of "air-plane" with which the U.S. Signal Corps—as the rulers of the American Aviation Service—hope to stop the war. Such a machine over the German lines would have about as much chance of getting home as the proverbial celluloid cat being chased through Hell by an asbestos dog.

America's Real Task.

The following paragraph appeared recently in several British papers:—

> The New York "Times" publishes a telegram from Dayton, Ohio, giving an interview with Mr. Orville Wright, who says that 10,000 aeroplanes would end the war within ten weeks. To sweep from the heavens every German aeroplane would be to put out the eyes of the German gunners.
>
> The United States, Mr. Orville Wright declares, should begin the construction of a vast fleet of little fighting machines carrying one man and a quick-firing gun, and send them to the front within the year. The best Germany can hope to achieve as regards the production of aircraft, Mr. Wright thinks, is to keep abreast of her European antagonists, and the United States, by making use of automobile plants, is in a position to hold the balance of power in the air.

Doubtless Mr. Orville Wright, or rather Major Orville Wright—to give him his present correct title—is perfectly correct, on the assumption that America can build fighting machines capable of catching the Germans, but that capability still remains to be proved. One cannot endorse his confidence in automobile plants. With a few brilliant exceptions, our "automobile plants" in this country have been less successful as aeroplane producers, both as regards quantity and quality, than have firms who made entirely different articles before the war. Our very best aeroplanes are not made by automobile firms at all, but by pure aeroplane firms, and by people used to woodwork rather than motor work, though, be it said, the genuine engineering firms have been very successful.

Anyhow, Major Wright is wrong. America can achieve much better average results by building great big bombing machines, in which a few pounds added here and there by rough work, and in which a few pounds of long French nails used instead of carefully applied minute brads do not matter, than she can achieve by trying to build the extremely highly developed fighting machines now used in Europe, in which every ounce is scraped off with sandpaper and a smooth file.

We expect, and we shall see in time, great things from America in this war, but it is most highly to be desired that the American people shall not give way to that very English vice of undue optimism, which only leads to underestimating one's enemy, and so to utter disaster.

C. G. G.

THE AERIAL NAVIGATORS.

A book which should be in the possession of all pilots, more especially R.N.A.S. pilots, is "Air Navigation for Flight Officers," by Lieut.-Comdr. A. E. Dixie, R.N. [Published by John Hogg. Price 10s. 6d. net, or 11s., post free, from the William Dawson Publishing Co., Ltd., 2, Breams Buildings, E.C.]

The author claims that the book condenses into a small compass all the subjects in navigation which R.N.A.S. officers are required to know. There are thirteen chapters to the book, and certainly every one of them is packed with information, so one may well believe the author's claim, and even if the knowledge thus gained of so enormous a subject can only, in the nature of things, be superficial, at any rate the book provides a very sound groundwork for aviators, young or old, who have only flown by map and compass, and have not studied navigation as such.

The first five chapters are devoted to the compass and its peculiarities, starting with elementary magnetism, methods of making magnets, effects of magnets, essential features in an aeroplane compass, the adjustment of deviation, methods of swinging machines for compass adjustments, bearing tables, and so forth. The next three chapters are concerned with meteorology, and give much interesting information on cloud formations, British weather, storm signals, forecasting, and other matters. The ninth chapter is concerned with astronomy, and gives various interesting tables. The tenth and eleventh chapters deal with actual navigation, beginning with Admiralty charts, and going on through course-laying, allowing for drift, interception of the courses of hostile aircraft (a capital idea this), and how to understand lights. Chapter 12 deals with fixing positions, and Chapter 13 with the use of maps

The book is well printed and excellently illustrated, so it is really uncommonly good value at the price apart from the fact that every cross-country aviator ought to know its contents by heart.

A CASH CONTRIBUTION.

The British Minister in Siam (states Reuter's Agency) has forwarded a further sum of £465 subscribed to the Siam British Subjects' Aeroplane Fund for the upkeep of two battleplanes, Siam No. 1 and Siam No. 2. The total sum thus subscribed in Siam is £4,965.

THE FLYING SERVICES AFTER THE WAR.

SOME POSSIBILITIES.

BY "BERKELEY."

Change in the manner of warfare has generally been a gradual process. The underlying principles do not change at all. The means of war and the weapons of war have varied and developed through the ages with slow but certain progress. Therefore the growth of the Flying Services must be considered invariably with due deference to the teachings of history.

The invention of gunpowder dates from some indeterminate period during the twelfth or thirteenth century, unless it be admitted that the inscrutable Chinese had knowledge of it in a still more remote age. Its entry into warfare was no doubt regarded by the warriors of the day as a vast revolution of method, in which civilised fighting gave way before the unholy skill of the scientist. The moment of transition could be seen, or so it seemed.

Yet generations passed before the manner of warfare underwent any radical alteration because of the new force. And to-day, when the daily news-prints tell us that the greatest brains of the country have left their counting-houses and have placed war on such a footing of intellectual skill that little remains to be learnt in the future, the development in the weapons of war still continues, apparently, with breathless rapidity, but in truth with little or no acceleration of its customary pace.

The rifle took its place in the British Army during the Peninsular War, yet over forty years later it had not been generally adopted throughout the Service. And so with each invention or improvement. Nothing comes swiftly to maturity.

Deceptive Rapidity.

To those who have watched closely the Flying Services since the days, now five years past, when they came tentatively into existence, the advance appears to have been incredibly swift. Accelerated though its progress has been by the present war, yet, when hostilities have drawn to a close military aeronautics will not yet have emerged from its earliest infancy. A hundred years hence, the progress of the past ten years will not be discernible in the general detail of history.

The Importance of Infancy.

Infancy is in all life a stage of high importance in development. All that is done during this period has a bearing on the future. Improper actions in early days reap their reward in maturity. It is easier also to affect the future efficiency of anything by the steps taken in infancy.

The war has given an unexpected opportunity to place the Flying Services of the country on a secure foundation, and to direct the future development in such a manner as will prevent the British Empire from losing its hard-gained superiority in these matters. But the times are critical, and it behoves those who speak of reform in flying matters to act warily, that mischief may be avoided.

The Popular Demand.

There is a growing demand on the part of the people for the creation of large and highly efficient aeronautical forces in the Navy and Army of the country. The nucleus already exists, but a huge expansion is needed, and the people are taking a part, because recent aerial actions of the enemy have interfered on several occasions with the amenities of life at home. But the people have only a limited objective—the defence of their homes from enemy aerial attack—and they are prone to disregard greater claims. Nevertheless, the time has come when something must be done.

All that is done in the expansion of the existing Air Services, or in the creation of a third and separate Air Service, should be in accordance with such principles as are of application in the future, and not be merely an expedient for use in the present war. Everything that is done to-day should possess value in the days to come. It is simpler, when laying down what may well be a fundamental organisation, to proceed on correct lines than it is at a later date to alter all arrangements.

The Peerage in the Press.

In the two leading Sunday news-prints, the "Observer" and the "Sunday Times," there are articles by the Lord Sydenham and the Lord Montagu of Beaulieu, both of whom have given deep consideration to the question of aeronautical policy. Lord Sydenham's article deals principally with the defence of England against attack by aeroplane, but it concludes with a passage stating the need for large increases both in matériel and personnel, and in an expression of opinion in favour of one single Air Service.

Lord Montagu's article, which is of considerable length, also deals with the question of aerial defence, and supports those who deem that the surest method of obtaining security is to carry out a vigorous offensive against German towns. He, too, favours the formation of a separate Air Service, and speaks of 10,000 aeroplanes as a proper number to put into the field in the immediate future.

Problems of Production.

Whether the single Air Service comes into existence or not, there is no question that the time has arrived to increase our aerial resources vastly, and that the existing organisation or organisations should be revised in accordance with the lessons of the present war.

It is a very simple matter to talk of doubling output, but when the effort is made the work does not possess simplicity. There is no real shortage of material from which to manufacture the aeroplanes required, and all other machines and vehicles that are complementary, but the training of the necessary mechanics and other hands required in the enlarged works and the personnel to maintain and fly the machines produced is by no means easy.

Neither the Entente Nations nor the Central Empires can rapidly increase their aerial forces to the figures daily quoted with eloquent ease in the Press and on the platform. The advantage, it is true, is with ourselves and our Allies, in that we have a larger reserve of men on which to draw, both in the field and in the workshops. The two critics quoted above offer no solution to the difficulty. The increase can be made, but the results will not be immediate.

Pilots.

To take one class in which a change of system must be made before many months have passed by, unless the world of topsy-turvydom is to continue throughout all time—the pilot. At present, in both the Royal Naval Air Service and the Royal Flying Corps it is the rule—to which there are but few exceptions—that the pilots

shall all be commissioned officers. In the early days of both Services half-hearted efforts were made to train non-commissioned officers and men in flying duties. The degree of success was limited, and the impression, perhaps unofficially, though it appeared to be officially held, spread that officers alone possessed the initiative necessary to make efficient aviators. A few non-commissioned officers have flown during the war, but have, as a rule, been given commissions as soon as they had proved their skill as pilots.

Officers Only.

The principle would appear to be inherently wrong. Perhaps in those days when flying was a pursuit reputed to be one of constant peril, and the officer caste of the British Army was recruited from those families who had for generations produced the professional leaders of men who created the Empire and who made the world respect the British soldier, it was proper that aeroplanes should be piloted by officers. Such officers were in effect leading. But the times have changed.

No longer are the officers of the Army drawn from a separate and gentle class. There is little essential difference between the man who leads and the man who is led in so far as birth and education are concerned. The fighting caste went as it should in the early days of the great trouble, and there are but few left to salt the Empire's forces.

The new officers have proved their worth. They have shown that they do not lack courage and that many of them have the instinct of leadership. But there is no longer any essential difference between the rank and file and the subaltern officers of the Army. The rank and file are the material from which the commissioned officer is selected. Therefore it cannot be held that any class in the Army has a monopoly of initiative or courage.

A Matter of Aptitude.

Secondly, it is no longer accepted that piloting requires any special degree of courage. Aptitude and a liking for aviation are necessary, but, then, similar attributes must be present in any occupation of an allied nature, such as, for instance, the driving of motor-cars. There is little difference in the position of the pilot and the chauffeur. Both are necessary parts of the mechanism and act under direction.

It is wasteful to employ officers, who it is to be assumed have had special training in the career of arms, as the drivers of aerial vehicles, when that work can generally be carried out as efficiently by men of lower rank. The duty of an officer is to lead. If he is to spend his time piloting aeroplanes on routine duties, he will have little time for aught else.

Observation and Leadership.

Observation, on the other hand, is highly technical in nature, and, if it is to be of value, must be carried out by personnel which has been highly trained in the art of war. There is every reason to employ officers on this work. They have, or should have, the necessary professional education.

Fighting squadrons flying into action in formation might be composed of aeroplanes piloted by non-commissioned officers or privates, and be led by an officer pilot flying a machine bearing distinctive markings. If the daily journals are to be trusted, this would appear to be an habitual practice of the Central Powers.

The use of the lower grades of the Service as pilots would reduce the number of officers necessary in proportion to the number of aeroplanes employed, and it would, in consequence, be possible to educate these officers more completely in the art of war.

(To be continued.)

The late Mr. William Iliffe.

By the death of Mr. William Iliffe, of Coventry, technical journalism loses one of its founders, and Midland England loses one of its greatest men. Starting with a printing and stationery business in Coventry, many years ago, William Iliffe first founded the "Coventry Standard," a weekly, and later produced a daily evening paper, which was a marked success. His first venture in technical journals was the "Cyclist," founded and edited by Henry Sturmey, and by far the greatest paper which ever dealt with cycling. From it sprang the "Autocar," which owes its pre-eminence to the genius of that Heaven-sent editor, H. Walter Staner, to whom I personally owe a deep debt of gratitude for his strenuous if unrequited efforts to inculcate into me the elements of orthodox editing. Also, the "Autocar" owed much to another of the old "Cyclist" staff, Harry Swindley, whose tragic fate not long ago deprived that paper of one of the most brilliant writers on motoring.

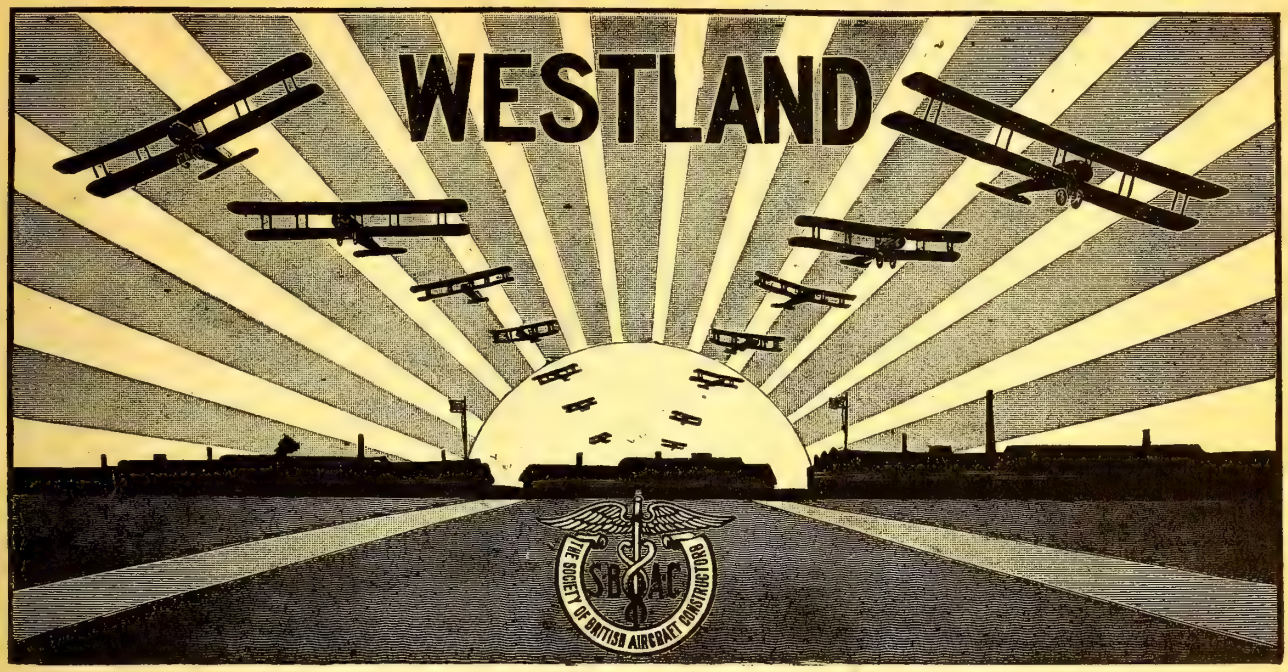
Another of William Iliffe's young men was one Alfred Harmsworth, who, after a salutary training with the firm, left to start a paper called "Answers"—the proposition being somewhat outside the scope of Mr. Iliffe's activities at the time. From "Answers" sprang later the "Daily Mail" and sundry other papers, and ultimately the Barony of Northcliffe.

With the growth of motoring and the decline of cycling as a pastime the "Cyclist" became the "Cycle and Motor Trades Review," a purely trade paper, with which I began my newspaper experiences in 1905. The growth of motor cycling as a sport led the firm, now world-famous as Iliffe & Sons, Ltd., to start the "Motor Cyclist," and the growth of industrial motors produced "Motor Traction," which gave his chance to Horace Wyatt, now secretary of the Society of British Motor Manufacturers, and one of the cleverest and wittiest of motor journalists. The "Autocar" and its latest offshoot, the "Light Car," produced F. C. Lafone, another exceptionally brilliant writer.

In 1909 the firm started the "Aero," under the joint editorship of Wilfred Aston and myself. Wilfred Aston, now a Captain A.S.C.—where he is perfectly wasted in these days when military aeronautics needs just such men as he—has positive genius with pen and pencil alike, and the "Aero" was a highly successful paper, so far as the esteem of all concerned with flying was concerned. Unfortunately, the comparative slump in flying in 1911 led the firm to turn it into a monthly magazine, and so led me to back my own opinion by starting The Aeroplane. On the "Aero," also, was Montague Tombs, now an A.I.D. officer, and a very able technical writer.

A list of all the Iliffe papers and of the men whose success in life is due to them would fill much space, but perhaps enough has been said to show the outstanding ability of the late head of the firm in judging the right moment at which to start a new paper and the right man to put in charge of it. Seldom, if ever, did he make a mistake, or have cause to regret his choice, and in Walter Staner and his son Edward Iliffe he had advisers whose judgment was of the highest value.

As an employer William Iliffe was as kindly and considerate as a man could wish, and when, as will happen in big firms, a minor employee was guilty of some



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punishable offence, his kindliness generally overcame even his strict sense of justice.

He took little part in public affairs, but none the less he was very much a power in the land. There used to be told of his shrewdness in handling difficult people a delightful story which deserves to go down to posterity. Long, long ago a certain self-important, particularly provincial, and very much uneducated member of the local Corporation, or City Council, or some such body, imagined that insufficient prominence was given in Mr. Iliffe's local paper to his ungrammatical speeches, and so he proceeded to call and demand pompously that he should no longer be thus neglected. The head of the firm endeavoured to put him off politely, but apparently seeing after a while that the soft answer did not turn away wrath, Mr. Iliffe rounded on him and said, "Very well! If I have any more argument, I shall have you reported *verbatim*." The joint in the harness had been found, and that local politician gave no more trouble. I have long treasured that story as the perfect example of the complete crush.

Of late years William Iliffe had practically retired to a well-earned rest, and the great business which he founded and developed has been carried on most ably by his son Edward, who is regarded by those who know him as being pre-ordained to political eminence whenever he cares to enter the great game. The mechanical side of the business has for long been managed by his other son Coker Iliffe.

In common with so many others who owe their real start in life to the late William Iliffe, I wish to convey to his family my deep regret that he did not live many years longer to enjoy his retirement, and I tender to them my sympathy in their loss. To me his kindly manner and his sound advice on many matters great and small will always be an enduring memory.—C. G. G.

The Gotha Gun Tunnel.

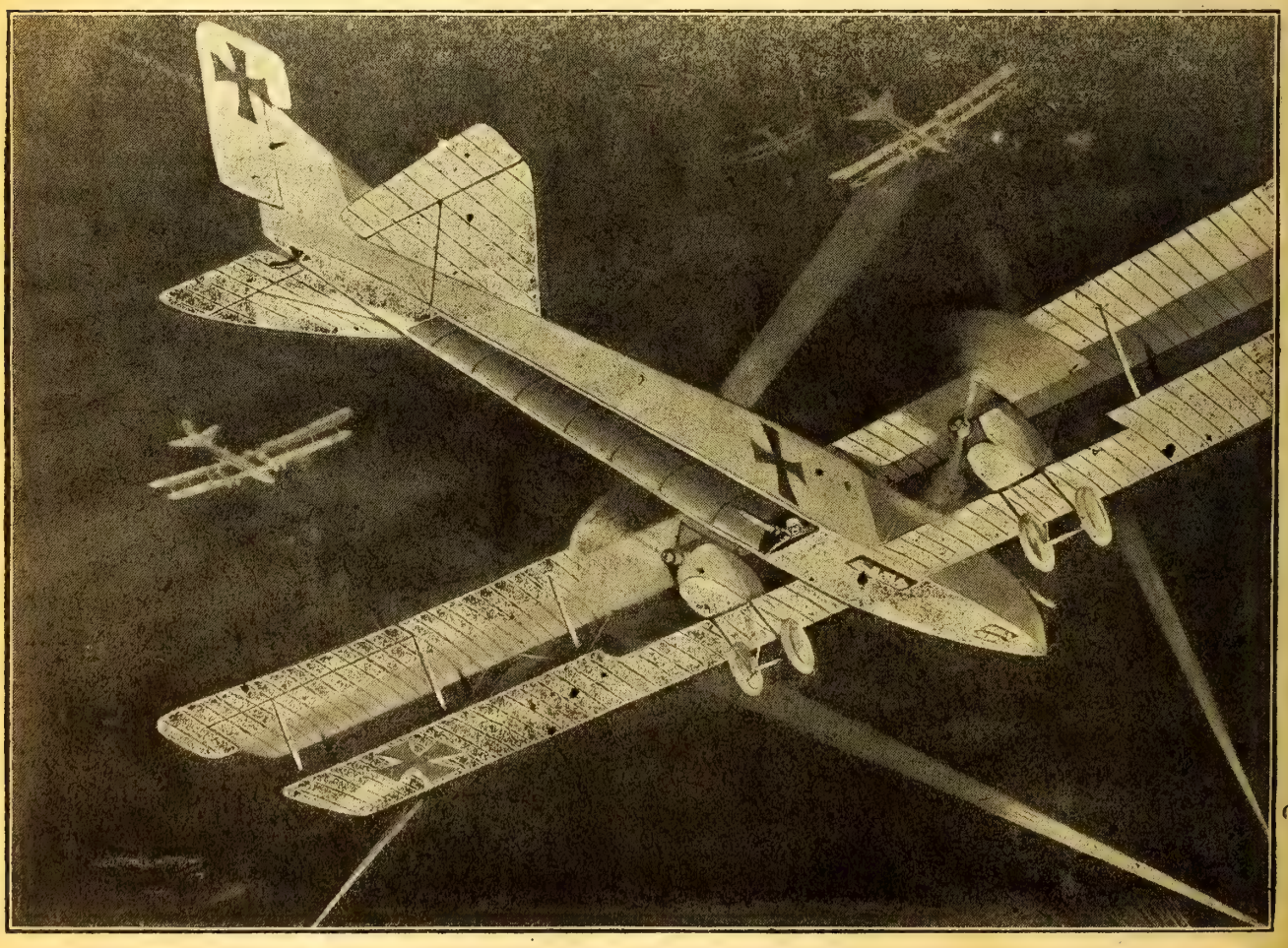
So much interest has been shown in the Gotha biplane that it seems well to explain the chief reason for the difficulty found in attacking it. In all ordinary aeroplanes there is what is commonly known as a "blind spot" under the tail, which, being interpreted, means that if an attacking pilot can get just behind and below the tail-plane the after-gunner on the pursued machine cannot fire at him because of the danger of blowing his own tail to pieces, or cutting a rudder or elevator control.

The Gotha designer has overcome this difficulty by making the fuselage in the form of a bottom-less tunnel, as shown in the accompanying sketches.

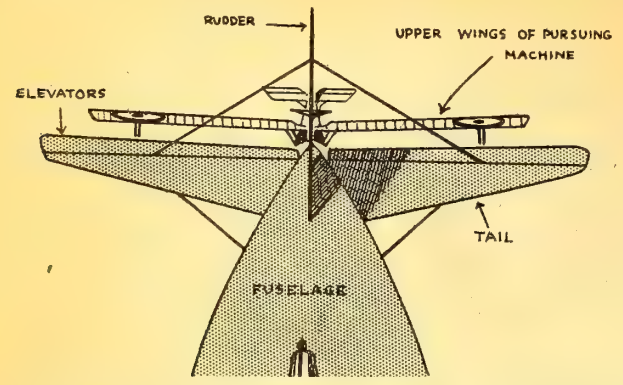
The first sketch shows the view seen by a gunner firing along the top of the fuselage at a machine which has secured the "tail attack" position. The second sketch shows, more or less, the view of the same machine seen by a gunner firing along the tunnel. In the first, one perceives that the blind spot caused by the tail, effectually hides all the vital parts of the attacking machine. In the second, one sees all the vital parts exposed.

The unsuspicious pilot, who, by skilful manœuvring, has tucked himself securely under the tail to pump bullets at leisure into what he imagines to be a defenceless monster, thus offers himself as an absolute "sitter" to the machine-gun artist at the other end of the tunnel. The same gun-layer (to use the R.N.A.S. term) can also fire directly downwards and to either side, and the forward gun-layer can come aft and work the upper gun at the same time, which gun also can be fired vertically downwards over the side.

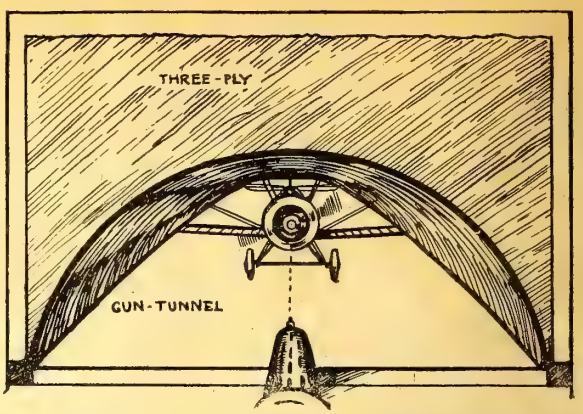
Thus, one sees how deadly to attackers a force of these machines can be, so long as their formation remains unbroken, for the only chance of any machine against them is quickness of manœuvre, and quickness of manœuvre needs room. If one single-seater attacks, it is the mark for several guns at once, not only from its



IN THE SEARCHLIGHTS: An impression of the lower stern-chaser of a Gotha Bomber, as seen from below when caught in a searchlight. The position of the gun in relation to the gun-tunnel is clearly shown.



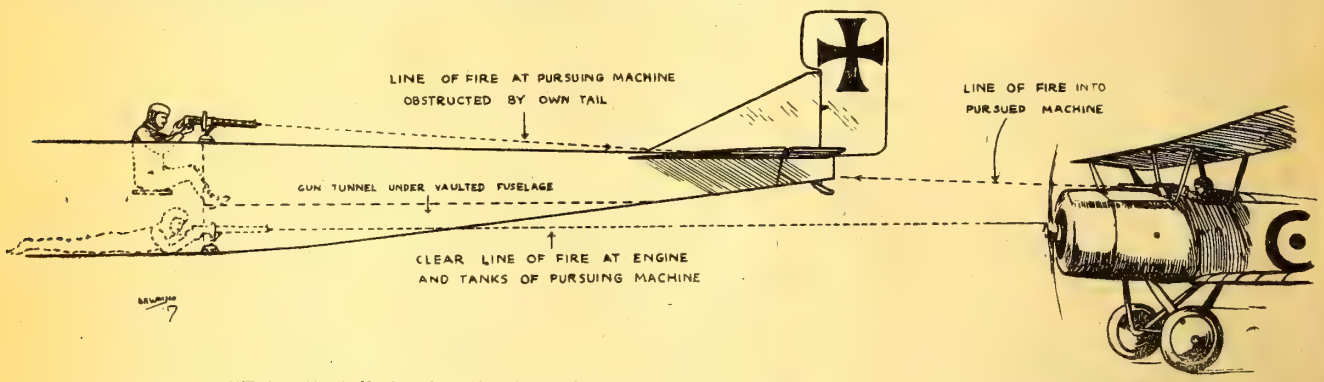
Sketch showing obstructed field of fire available to the ordinary rear gun in firing dead aft.



The introduction of the gun-tunnel has removed the last "blind spot" from the Gotha three-seater. The vital parts of the attacking machine are thus exposed.

target, but from neighbouring machines as well, and if more than one attack, there is no room for manœuvre, or else each attacking machine is the mark for the guns of machines other than its intended victim.

Obviously, then, the only way to achieve results is to break up the formation, so that several small machines can attack one big one at once, and thus divide the fire of the guns. Happily, there are several methods of breaking the formation, though one must not discuss them here, because such a discussion would be of use to the enemy. If these methods are put into use promptly, instead of being pigeon-holed, as has been the case too often in the past with new ideas, we should have little more trouble with Hun raiders.



Side View of "Tail Attack," showing the lines of fire of the two gunners whose views are illustrated above.

OUR HUMOROUS POLICE.

The Commissioner of Police of the Metropolis makes this announcement:—

Whenever enemy aeroplanes are observed above the land in any part of a very considerable area of the Eastern Counties the Military give the London Authorities the warning "Take air raid action."

In view of the fact that the objective of these enemy aircraft may not be the Metropolis, but towns elsewhere situated, it has been decided not to pass on this warning to the public until there are indications that the enemy aircraft are proceeding in the direction of London and are within a certain distance of it.

In such contingency the Authorities, realising the desirability of letting the public know in time to enable them to take cover, are endeavouring to arrange for obtaining this information, so that they may transmit it to the public.

The Commissioner notifies for public information that in the event of his receiving intelligence that enemy aircraft are flying towards London, police, regular and special, will be sent out from all police stations exhibiting through the thoroughfares the following notice:—

POLICE NOTICE
TAKE COVER.

Pending some more effective measures for circulating this news, the Commissioner trusts that this emergency expedient will prove not ineffective.

[One longs to see our police-sandwich-men at work, or will the notice be carried as a kind of "Excelsior" banner?—Ed.]

THE FIRST AIR RAID WARNING.

The first official police warning of an impending air raid on London was given on July 14th, but the alarm proved to be false, and after a sojourn in various places of safety people once more emerged into the streets. At about 7.20 p.m. constables left their various stations exhibiting the official placards: "Police notice. Take cover."

Mounted on bicycles they rode through the streets, and the result of their sudden appearance was that many of the people immediately disappeared. There was a general alacrity in obeying the injunction, but theatres went on with their performances, and East London shopping centres were busy. No one was allowed to leave the cinema theatres. Some women fainted in the streets, and a doctor said "These women would probably have fainted at the sound of the first bomb, and then it would not have been easy to bring them in and to attend to them in a safe place."

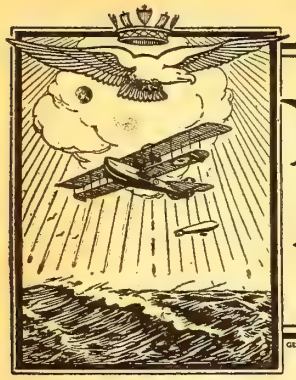
A few minutes after the warning had been given, Boy Scouts on bicycles rode about shouting "All clear." Thereupon the streets filled again quickly, though none explains why the unofficial vocal Boy Scouts should have been believed as against the official and printed police.

AIR RAIDS AND THE TELEPHONE.

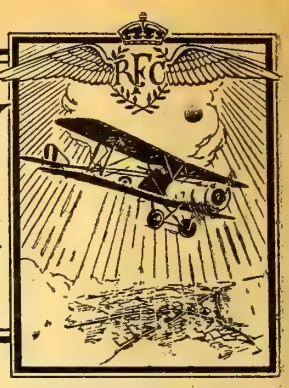
It is reported that the Home Office authorities have practically completed a scheme for giving public warnings of air raids, and an announcement on the subject may be expected almost immediately.

The Secretary of the General Post Office states that on the occasions of the recent air raids the transmission of official telephone messages of urgent importance has been seriously interfered with by the inconsiderate and unnecessary use of the telephone by private subscribers. The Postmaster-General earnestly appeals to the public to use the telephone as little as possible on such occasions, and on no account to call up the police or others on unimportant or merely personal matters. If this warning is not regarded it may become necessary for the Postmaster-General to curtail the telephonic facilities afforded to private persons on occasions of public emergency.

[The public telephone call offices were, apparently, cut off from use as it was, with the result that much acute anxiety was caused to perturbed wives and mothers who wished to telephone to their men-folk in the City to assure themselves of their safety. It would, of course, be difficult to differentiate between one class of call and another, but one feels that "merely personal matters" of such a nature are at least as important as a good many official calls, and far more so than ordinary commercial calls. One quite recognises the pressure of work on these occasions, but if any part of the telephone system is to be shut down to make way for official messages one suggests it should rather be the private lines than those available at other times to the public.—Ed.]



NAVAL and MILITARY AERONAUTICS



FROM THE "LONDON GAZETTE."

War Office, July 10th.

REGULAR FORCES—Establishments—R.F.C.—Mil. Wing.—Flt. Comdrs.—From Flying Officers, and to be temp, Capts. whilst so empld. :—Temp. Sec. Lt. P. F. Fullard, Gen. List, June 19th. Sec. Lt. G. A. Lascelles, Spec. Res., June 24th.

Park Comdr.—Lt. (temp. Capt.) F. A. G. Noel, Spec. Res., from an Equipt. Officer, 1st Cl., and to be temp. Maj. whilst so empld., June 8th.

The following references to aeroplanes are contained in a dispatch from Lt.-Gen. Sir Stanley Maude, Commander-in-Chief, Mesopotamian Expeditionary Force, describing the operations carried out by him in the period extending from August 28th, 1916, when he assumed command, until March 31st last, three weeks after the fall of Bagdad :—

Lieut.-General Marshall next took in hand the reduction of the Hai Salient, the extensive trench system which the Turks held astride the Hai River, near its junction with the Tigris. The operations lasted from January 20th to February 5th, and were successfully concluded. During this period the splendid fighting qualities of the infantry were well seconded by the bold support rendered by the artillery, and by the ceaseless work carried out by the Royal Flying Corps. These operations again resulted in heavy losses to the enemy, as testified to by the dead found, and many prisoners — besides arms, ammunition, equipment, and stores—were taken, whilst the Turks now only retained a fast vanishing hold on the right bank of the Tigris.

On March 8th a bridge was constructed across the Tigris, half a mile below Bawi, and the cavalry, followed by a portion of Lieut.-General Cobbe's force, crossed to the right bank in order to drive the enemy from positions which our aeroplanes reported that he had occupied about Shawa Khan, and north-west of that place, covering Bagdad from the south and south-west.

During the forenoon of the 9th, Shawa Khan was occupied without much opposition, and aeroplanes reported another position one and a half miles to the north-west, and some six miles south of Bagdad, as strongly held. Our attack against this developed later from the south and south-west in an endeavour to turn the enemy's right flank.

* * *

War Office, July 11th.

REGULAR FORCES.—Memorandum.—The date of seniority of Flt. Lt. C. L. E. Geach as temp. Capt. is April 1st, 1917, and not as in the "Gazette" of June 29th, 1917.

War Office, July 12th.

Establishments. — R.F.C. — Mil. Wing. — Schools of Instruction.—Schools of Mil. Aeronautics.—Instrs. (Graded as Flt. Comdrs.), and to be temp. Capts. whilst so employed :—Temp. Lt. G. H. Gordon, Gen. List, a Flying Officer, March 28th. Lt. G. G. Hubbard, Spec. Res., a Flying Officer, April 20th. (Graded as Equipment Officers, 1st Cl.).—Lt. (temp. Capt.) A. A. Nathan, Yeo. ,T.F., a Flying Officer (Observer), and to retain his temp. rank whilst so employed, May 26th. Sec. Lt. (temp. Lt.) C. R. Fleming-Williams, Spec. Res., from an Asst. Instr. (graded as an Equipment Officer, 2nd Cl.), and to be temp. Capt. whilst so employed, June 20th.

Asst. Instrs. (graded as Equipment Officers, 2nd Cl.).—Temp. Sec. Lt. R. Rainford, Gen. List, an Equipment Officer, 3rd Cl., and to be temp. Lt. whilst so employed, Feb. 27th, 1917. Temp. Sec. Lt. C. H. Collins, Gen. List, a Flying Officer, and to be temp. Lt. whilst so employed, March 28th, 1917. Sec. Lt. (temp. Lt.) L. V. Drake, Yeo., T.F., a Flying Officer, vice Sec. Lt. (temp. Lt.) A. C. Day, Spec. Res., March 31st, 1917. Temp. Lt. F. de B. Collenette, Gen. List, a Flying Officer (Observer), May 13th, 1917. May 26th, 1917: Sec. Lt. (temp. Lt.) D. Clark, R.F.A., T.F., a Flying Officer (Observer); Temp. Sec. Lt. H. Franklin, Gen. List, an Equipment Officer, 3rd Cl., and to be temp. Lt. whilst so employed.

War Office, July 13th.

REGULAR FORCES—Establishments—R.F.C.—Mil. Wing.—Sqdn. Comdr.—Lt. (temp. Capt.) A. W. H. James, M.C., Hrs., from a Flt. Comdr., and to be temp. Maj. whilst so employed, June 26th.

Flt. Comdr.—Temp. Sec. Lt. (temp. Lt.) W. J. Tempest, D.S.O., Gen. List, from a Flying Officer, and to be temp. Capt. whilst so employed, June 27th.

Balloon Co. Comdr.—Graded as a Sqdn. Comdr.—Capt. H. M. Meyler, M.C., Bord. R., from a Balloon Co. Comdr. (graded as a Flt. Comdr.), and to be temp. Maj. whilst so employed, June 16th.

Special Appt.—Sec. Lt. (temp. Lt.) A. C. Day, Spec. Res., from an Asst. Instr., R.F.C., School of Mil. Aeronautics, retains the grading of an Equipment Officer, 2nd Cl., and the temp. rank of Lt. whilst so employed, March 31st.

Temp. Lt. C. B. Baker, Oxf. and Bucks. L.I., to be an Adjt., vice Lt. G. W. Panter, R. Irish Rifles, May 21st.

Equipment Officers, 1st Cl.—Sec. Lt. (temp. Lt.) E. McEvoy, Oxf. and Bucks. L.I., from the 2nd Cl., and to be temp. Capt. whilst so employed, June 24th.

* * *

A Supplement to the "London Gazette" issued on July 13th contains a somewhat belated dispatch from Viscount Buxton, High Commissioner for South Africa, on military affairs in Rhodesia and the operations of the Rhodesian forces from the outbreak of the war to the beginning of 1916. The report is divided into five parts: (1) Operations on the West; (2) Operations on the North-Eastern Border; (3) the Tanganyika Naval Expedition; (4) the general situation in Rhodesia and the raising of forces for service in other fields than those above mentioned; (5) Conclusion.

The following passages are concerned with aircraft :—

It would have been satisfactory if the third and largest of the German ships could have been accounted for by the British flotilla, but she did not risk an engagement. After being bombed by a Belgian aeroplane, she was scuttled by the Germans in Kigoma harbour, on the eastern shore of the Lake.

So ended Germany's command of Tanganyika. Apart from the material loss inflicted on the enemy, the success of the Naval Expedition did much to enhance British prestige among the natives, not only in the immediate neighbourhood of the Lake but in the northern districts of Rhodesia and in adjacent German territory. The German supremacy of the Lake had for years been recognised as an established fact.

The following distinctions were awarded to members of the Expedition :—

Distinguished Service Medal.

Petty Officer Mechanic Chas. Ernest Cobb, R.N.A.S.

Petty Officer Mechanic Donald McLean Graham, R.N.A.S.

[One assumes that the R.N.A.S. ratings were attached to the Belgian aeroplane forces.—Ed.]

War Office, July 14th.

REGULAR FORCES—Establishments—R.F.C.—Mil. Wing.—Wing Comdr.—Capt. (temp. Maj.) A. S. Barratt, M.C., R.A., from a Sqdn. Comdr., and to be temp. Lt.-Col. whilst so empld., June 2nd, but without pay or allowances prior to June 26th.

Sqdn. Comdr.—Lt. (temp. Capt.) T. L. Mallory, Lan. Fus., Spec. Res., from a Flt. Comdr., and to be temp. Maj. whilst so empld., May 14th.

Adjts.—From Equipment Officers, 3rd Cl., June 26th.—Lt. M. Skitt, R.F.A., Spec. Res.; temp. Lt. J. Stewart, R. Sc. Fus.

Equipment Officers, 1st Cl.—Temp. Capt. W. H. Miles, Gen. List, from a Wing Instr. in Gunnery (graded as a Flt. Comdr.), and from a Flying Officer, April 18th.

* * *

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign.

The King has given unrestricted permission in all cases to wear the Decorations and Medals in question :—

PRESENTED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

LEGION D'HONNEUR.

CROIX D'OFFICIER.

Temp. Brig.-Gen. C. A. H. Longcroft, Welsh Regt.
Bt. Lt.- Col. B. D. Fisher, D.S.O., Lrs.

CROIX DE CHEVALIER.

Bt.-Maj. (temp. Lt.-Col.) E. R. Ludlow-Hewitt, M.C., R. Irish Rif. and R.F.C.
Maj. I. A. E. Edwards, R.A. and R.F.C.
Capt. (temp. Maj.) C. G. S. Gould, R.A. and R.F.C.
Capt. (temp. Maj.) F. M. Roxby, N. Staffs R., Spec. Res. and R.F.C.
Capt. E. R. L. Corballis, R. Dub. Fus. and R.F.C.
Lt. (temp. Capt.) A. McR. Moffat, Arg. and Suth'd Highrs. and R.F.C.
Sec. Lt. (temp. Lt.) R. Gregory, Conn. Rang., Spec. Res. and R.F.C.

CROIX DE GUERRE.

Act. Flt. Com. C. D. Booker, R.N.A.S.
Lt. F. E. Brown, R. Dub. Fus., Spec Res. and R.F.C.
Temp. Capt. C. M. Clement, Gen. List and R.F.C.
Sec. Lt. J. E. De Watteville, Cam. Highrs. and R.F.C.
Sec. Lt. (temp. Lt.) C. M. Down, Herts R. and R.F.C.
Temp. Sec. Lt. C. G. Durham, Gen. List and R.F.C.
Sec. Lt. (temp. Lt.) A. H. George, Ches. R. and R.F.C.
Temp. Sec. Lt. (temp. Capt.) H. J. Larkin, Gen. List and R.F.C.
Lt. (temp. Maj.) L. W. Learmount, M.C., R.F.C., Spec. Res.
Sec. Lt. (temp. Capt.) T. Macleod, R.F.C., Spec. Res.
Temp. Sec. Lt. E. R. Pennell, Gen. List and R.F.C.
Temp. Sec. Lt. J. R. Smith, Gen. List and R.F.C.
Temp. Capt. P. D. Stuart, Gen. List and R.F.C.
Temp. Sec. Lt. B. A. Taylor, R.F.C.
Temp. Capt. R. N. Thomas, Gen. List and R.F.C.
14956 1st Cl. Air Mech. (Actg. Cpl.) A. Beebee, R.F.C.
65005 2nd Cl. Air Mech. W. Harper, R.F.C.
51088 2nd Cl. Air Mech. H. McMillan, R.F.C.

MEDAILLE MILITAIRE.

77354 2nd Cl. Air Mech. E. Bowen, R.F.C.
7504 Sgt. J. Brown, R.F.C.
4240 Cpl. J. Richmond, R.F.C.
12315 2nd Cl. Air Mech. E. H. Sayers, R.F.C.
8197 1st Cl. Air Mech. E. Trehearn, R.F.C.

War Office, July 16th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Staff Officer, 3rd Cl. (graded for pay as a Staff Capt.).—Temp. Sec. Lt. R. Addenbrooke-Prout, Gen. List, and to be temp. Capt. whilst so empld., March 11th.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts. while so empld. :—Temp. Lt. H. H. James, Gen. List, June 15th. Temp. Lt. W. A. Bond, M.C., Yorks L.I., June 30th.

Park Comdrs.—From Equipt. Officers, 1st Cl., and to be temp. Majs. whilst so empld. :—Lt. (temp. Capt.) R. K. Pillers, North'n R., Spec. Res. ; Lt. (temp. Capt.) C. Barber, Spec. Res., June 20th.

Equipt. Officers, 1st Cl.—Temp. Lt. W. B. Cushion, Gen. List, from the 2nd Cl., and to be temp. Capt. whilst so empld., July 2nd.

AIR COMPASS BRANCH.—Supt. (graded as a Park Comdr.).—Temp. Sec. Lt. (temp. Capt.) M. K. Cooper-King, Gen. List, from a Staff Capt., and to be temp. Maj. whilst so empld., May 19th.

SCHOOLS OF INSTRUCTION.—ARMAMENT SCHOOL.—Comdt. (graded as a Park Comdr.).—Lt. (temp. Capt.) A. C. Bishop, Yeo., T.F., from a Wing Instr. in Gunnery (graded as Equipt. Officer, 1st Cl.), and to be temp. Maj. whilst so empld., June 12th.

Instr. (graded as an Equipt. Officer, 1st Cl.)—Sec. Lt. (temp. Lt.) J. Pearce, K.O.S.B., from an Equipt. Officer, 2nd Cl., and to be temp. Capt. whilst so empld., June 12th.

NAVAL.

The following appointments have been made in the Royal Naval Air Service :—

JULY 10th.—Temp. commissions as Lt. (R.N.V.R.) have been granted to the following, seny. as under :—C. J. Proctor, July 6th. E. B. de Merrall, July 8th. M. D. M. Dando and C. J. Smith, July 9th.

JULY 13th.—A temp. commission as Lt. (R.N.V.R.) has been granted to E. H. Carmichael, seny. July 12th.

JULY 14th.—Flt. Comdr.—J. Bird, granted rank of Actg. Squadron Comdr., seny. July 11th.

Flt. Lt. (temp.).—W. P. Groves, granted rank of Actg. Flt. Comdr. (temp.), seny. July 11th.

ADMIRALTY COMMUNIQUÉS.

JULY 10th.—The Commodore, Lowestoft, reports that at 8 p.m. yesterday (July 9th), one of H.M. armed trawlers, "Iceland," Lt. P. Douglas, R.N.R., in command, destroyed two enemy seaplanes, and brought four prisoners back into port.

JULY 11th.—A report has been received from the Vice-Admiral, Eastern Mediterranean, that on the night of July 9th a successful attack was carried out by the Royal Naval Air Service against the Turkish-German Fleet lying off Constantinople (Golden Horn).

When the "Goeben," surrounded by warships (including submarines), had been located, the attack was made from a height of 800 ft. Direct hits were obtained on the "Goeben" and on the other enemy ships near her. Big explosions took place on board them, and several fires were observed.

The War Office was also attacked and a direct hit obtained.

The enemy appeared to have been completely surprised, as until the bombs had been dropped no anti-aircraft batteries opened fire.

Our force returned safely without any casualties.

JULY 11th.—Whilst on patrol on Wednesday, July 11th, a flight of five machines of the R.N.A.S. met and engaged a formation of 10 Albatros scouts and three large two-seater machines south-west of Nieuport. Three of the enemy scouts were driven down completely out of control, and two others were driven down.

One of our machines is missing.

JULY 12th.—The Vice-Admiral, Eastern Mediterranean, reports :—In the course of attacks on the enemy positions on the Gallipoli Peninsula, Royal Naval Air Service machines sank a tug lying off Chanak.

JULY 12th.—Bombing raids were carried out by the Royal Naval Air Service last night (11th-12th) on the following military objectives :—

Varssenaere (south-west of Bruges).
St. Denis Westrem (south-west of Ghent).
Ghistelles (five miles south-east of Ostend).
Ostend railway lines and electric power station.

The railway siding at Zarren (four miles east of Dixmude) was attacked by gunfire from the air, and bombs were dropped on a train near St. Denis Westrem.

A fire was caused by bombs near Ostend electric power station. A heavy explosion was also caused at Varssenaere railway dump, followed by an intense conflagration, which was still burning half an hour later. Several tons of bombs were dropped.

All machines returned safely.

JULY 13th.—Bombing raids were carried out by the R.N.A.S. last night (12th-13th) on the following military objectives :—

Aertrycke aerodrome (eight miles south-west of Bruges).
Houttave-Nieuwmunster aerodrome (north-west of Bruges).
Ghistelles aerodrome (south-east of Ostend).
Railway junction north of Thourout Station (about 10 miles south-south-west of Bruges).
Bruges dock and canal bank dumps.
Railway junction south of Ostend Harbour.

The visibility was generally very poor, and in consequence observation of results obtained was difficult.

A bombing attack was also made on Solway Works, Zeebrugge, and root of Zeebrugge Mole. In all several tons of bombs were dropped.

All machines returned safely.

JULY 16th.—During last night, July 15th-16th, several tons of bombs were dropped by the Royal Naval Air Service on the following military objectives :—

Solway Works, Zeebrugge.
Railway junctions and sidings at Ostend.
Railway sidings and dumps at Middelkerke.
Railway junction at Thourout.
Motor transport convoys and railway sidings at Lichtervelde (20 miles east of Nieuport).

All our machines returned safely.

THE CASUALTY LIST.

Reported July 11th.

MISSING.—Eyre, Flt. Lt. C. A., R.N.
Hillaby, Flt. Sub-Lt. E. C., R.N.
Millward, Flt. Sub-Lt. K. H., R.N.
Ramsay, Flt. Sub-Lt. D. W., R.N.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Traynor, Flt. Sub-Lt. W. E., R.N.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER.—Fletcher, Flt. Sub-Lt. A. H. V., R.N.

PREVIOUSLY UNOFFICIALLY, NOW OFFICIALLY, REPORTED PRISONER.—Laurence, Flt. Lt. C., R.N.

Reported July 12th.

SLIGHTLY WOUNDED.—Tanner, Flt. Sub-Lt. J. C., R.N.

KILLED.—Austins, A., Air Mech., 1st Gde., F.23604.
Bishop, W., Officer's Stew., 3rd Cl., L.8948.
Cordell, J., Air Mech., 2nd Gde., F.9435.
Gilmour, J., P.O. Mech., F.368.
Grimes, F. T., Air Mech., 1st Gde., F.6092.
Huggett, A. J., Air Mech., 1st Gde., F.13444.
Pigg, D. E., Act. Air Mech., 1st Gde., F.4376.
Russell, G. A., Officer's Stew., 2nd Cl., L.7598 (Ch.)

Sanders, E. W., Air Mech., 1st Gde., F.3442.
Sharp, J. C., Act. Air Mech., 1st Gde., F.12040.
Died of Wounds.—Rogers, D., Officer's Stew., 3rd Cl., L.7600 (Ch.)

Reported July 16th.

Killed.—Busby, Flt. Sub-Lt. E. W., R.N.
Accidentally Killed.—Morrison, Flt. Sub-Lt. R. B., R.N.
Ellis, Flt. Sub-Lt. S. E., R.N.
Missing, believed Killed.—Robinson, Flt. Lt. W. E., R.N.
Kendall, Flt. Sub-Lt. E. H., R.N.
Jenks, Observer Sub-Lt. J. C. A., R.N.
Missing.—Pegler, Flt. Sub-Lt. C. R., R.N.
Wounded.—Allan, Flt. Sub-Lt. J. A. M., R.N.
Accidentally Injured.—Rowse, Actg. Flt. Comdr. G. M. T., R.N.
Mulholland, Prob. Flt. Officer D. B., R.N.
Previously reported Missing, now reported Killed.—McNeil, Flt. Sub-Lt. P. G., R.N.
Parker, Flt. Sub-Lt. L. H., R.N.

Reported July 17th.

Accidentally Injured.—Macdonald, Flt. Lt. K. G., R.N.
Previously reported Killed, now reported Died as a Prisoner.—Fleming, Flt. Lt. G. R. S., R.N.

PERSONAL NOTICES.

Deaths.

ALLAN.—Flt. Sub-Lt. Hugh Allan, R.N., only son of Lt.-Col. Sir Montagu Allan, C.V.O., whose death was announced last week, was educated at Lennoxville Preparatory School and Eton (where he was a member of "Pop"), and at McGill College. In September, 1915, he joined the Royal Highlanders of Canada, and during the winter of 1916 he took the machine-gun course at a Canadian School in England. In June, 1916, he transferred to the R.N.A.S., and went to the Western front last May.

EPPSTEIN.—Flt. Sub-Lt. Maurice William Wallis Eppstein, R.N.A.S., who was missing after the raid on Zeebrugge on May 12th, and is now officially reported killed, was the younger son of the Rev. W. C. Eppstein, Rector of Lambourne, Essex, and formerly headmaster of Reading School. Educated at Cheam School, the R.N.C., Osborne, and the R.N.C., Dartmouth, he at the outbreak of war was a midshipman. In September, 1916, he was gazetted to the R.N.A.S. Mr. Eppstein was 20 years of age. He was a very fine runner, and at Dartmouth was chief whip of the Britannia Beagles.

At the outbreak of the war he was a midshipman on H.M.S. "Hibernia," but in September, 1916, he entered the R.N.A.S., soon distinguishing himself as "a record pupil." He was appointed sub-lieutenant last March. His commanding officer writes:—"Your son was an exceptional officer, skilful and daring in his air work, and adding to this a power of organisation and management which made him invaluable in the routine work. There is no need for me to say anything of the personal qualities that made him such a general favourite, and the loss of which has made so great a void among even us, who are of necessity accustomed to sudden voids. . . . You may at least feel the consolation that he was lost in the execution of brave and gallant service."

KENDALL.—Flt. Sub-Lt. E. H. Kendall, R.N., who was reported missing, believed killed, when flying in action, was the younger son of E. C. Kendall, late Capt. Royal Cornwall Rangers Militia.

MORRISON.—An inquest was held at Chatham on July 14th on Flt. Sub-Lt. Donald Beckett Morrison, R.N.A.S., aged 22. The evidence showed that the late officer left an aerodrome at six in the evening for a practice flight. After being in the air twenty minutes the aeroplane made a spiral nose-dive, and fell to the ground. The body of Mr. Morrison was extricated from under the motor. Death must have been instantaneous. Mr. Morrison was described as an aviator of considerable experience. He had been at Gallipoli and in France. A verdict of accidental death was returned.

WHIGHAM.—Flt. Sub-Lt. Robert (Roy) S. Whigham, R.N., was the younger son of Mr. and Mrs. W. B. Whigham, of San Cristobal, Argentine Republic. Educated at Eastbourne and Sedbergh, he had passed the entrance examinations for Birmingham College of Engineering. He secured his commission in the R.N.A.S. in July, 1916, and was drowned on active service on May 9th last, in his 19th year.

His Commander writes:—"He was a fine boy, keen and plucky, and full of his work. He was only under my command a very short time, but during that period did extremely useful work."

Engagement.

WATKINS—ROBERTSON.—A marriage has been arranged and will take place on July 21st, at Blackheath, between Flight Lieut. S. R. Watkins, R.N., only son of Mr. F. Watkins, of Bognor, and Frances Jessie, only child of Mr. and Mrs. A. Gordon Robertson, of 29, Samon Road, Anerley, S.E.

Birth.

CHAPMAN.—On July 13th, at 89, Lancaster Gate, W., the wife of Flt. Lt. C. H. Murray Chapman, R.N., of a daughter (still-born).

The following report, supplementing the Naval communiqués of July 10th, was published in the "Times" of that date:—

The two seaplanes, carrying torpedoes, were bent on the destruction of craft in the North Sea. One of them came down and, it is said, discharged a torpedo at a passing steamer. It missed its mark, and by this time the patrol boat had come within striking distance. The seaplane, after missing her quarry, tried to rise, but there was a choppy sea on.

While she was making these efforts a well-directed shot from the patrol boat's gun smashed her, and she began to settle beneath the water, with her crew of two struggling to get free from the wreckage. The other seaplane came down to give her assistance, and she, too, was smashed by gunfire. The two men from the first were rescued by another patrol boat, and subsequently the other two were picked up.

* * *

One is under the impression that the aeroplane which bombed the "Goeben" and the Turkish War Office is that which occasioned so much sensation in Rome on arriving from London. Presently our High Authorities will begin to believe in big aeroplanes.

MILITARY.

G.H.Q. Communiqués.

July 10th, 9.45 p.m.—Bad weather again prevented aerial operations on either side yesterday.

July 11th, 10.12 p.m.—Bad weather yesterday prevented aerial activity on either side until the evening.

During the night we bombed two enemy aerodromes, all our machines returning safely.

July 12th, 9.10 p.m.—There was great activity in the air yesterday. A large number of bombs were dropped during the night on enemy aerodromes and ammunition dumps, and during the day eight other successful raids were carried out by our aeroplanes.

In the course of air fighting four German aeroplanes were brought down, and six other hostile machines were driven down out of control.

Three of our machines are missing.

July 13th, 9.15 p.m.—On the night of the 11th-12th inst. bombing operations against the enemy's railway stations, huts-ments, and aerodromes were again carried out with success. All our machines returned.

Yesterday there was unceasing aerial activity on both sides from dawn till late at night. The fighting, which resulted greatly in our favour, was the most severe that has been experienced since the commencement of the war.

Continuous engagements took place between large formations, consisting in some cases of as many as 30 machines. As a result of these encounters 14 German aeroplanes were brought down, three of which fell within our lines, and 16 other hostile machines were driven down out of control. In addition, one enemy machine was shot down by a direct hit from our anti-aircraft guns.

While our scout machines were engaged in fighting, other British aeroplanes took many photographs, and the bombing of the enemy's aerodromes, dumps, and railway stations was continued, large numbers of bombs being dropped with good results.

Nine of our machines are missing.

July 14th, 8.45 p.m.—Bombing operations by our aeroplanes were continued with success yesterday and during the preceding night. Fighting in the air took place throughout the day, in the course of which four hostile machines were brought down and 10 others were driven down out of control. Another enemy aeroplane was shot down within our lines by our anti-aircraft guns.

Seven of our machines are missing.

July 15th, 8.50 p.m.—On the night of the 13th-14th inst., four important railway stations behind the enemy's lines and a large German rest camp were bombed by our aeroplanes.

Yesterday in spite of heavy thunderstorms throughout the day, bombs were dropped on a hostile aerodrome and an enemy ammunition dump, and much valuable work was done in co-operation with our artillery.

In air fighting three German machines were brought down and two others were driven down out of control.

Five of our machines are missing.

July 16th, 8.46 p.m.—Three German aeroplanes were brought down yesterday in air fighting.

Three of our machines are missing.

War Office Communiqués.

July 11th.—The G.O.C. British Forces in Mesopotamia, reporting upon the measures taken to punish the Turkish irregular

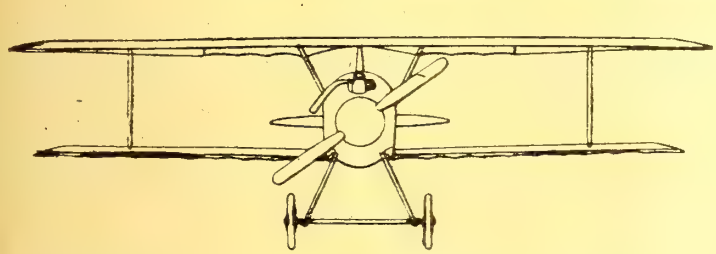
(*Continued on page 187.*)

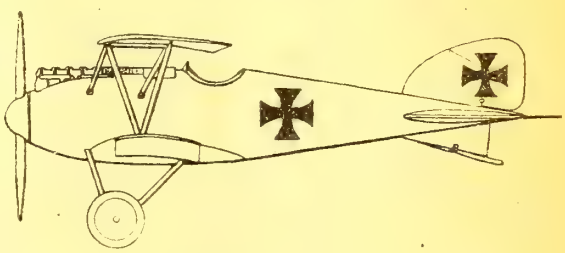
AERONAUTICAL ENGINEERING

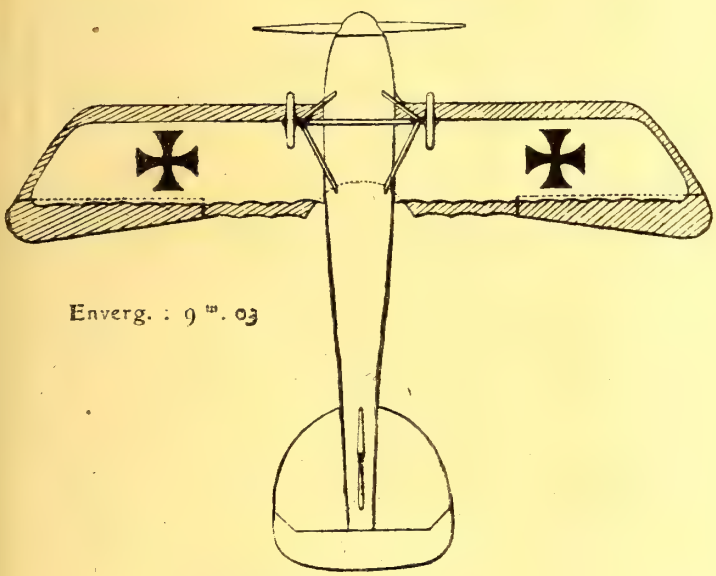
SUPPLEMENT TO "THE AEROPLANE"

INCORPORATING AIRCRAFT ENGINEERING, AERODYNAMICS, AND MATTERS PERTAINING TO THE AERONAUTICAL ENGINEER AND THE AIRCRAFT TRADER

THE NEW GERMAN FIGHTERS.







THE D.III ALBATROS.

Span.—Upper Wing 9.03 metres (30 ft.).

Span.—Lower Wing 8.75 metres (29 ft.).

Chord.—Upper Wing 1.5 metres (4 ft. 11 in.).

Gap.—1.5 metres (4 ft. 11 in.).

Stagger.—0.22 metre (9 in.).

POINTS TO BE NOTED.—Upper and Lower Span almost equal. Projecting Ailerons. Dihedral to Lower Plane only. Rudder and Fin entirely above Fuselage. Tiny Fin below Fuselage. Solid Elevator with balanaced projections. Rounded Fuselage, with pot on Propeller.

Motor.—Fixed Mercédès, 175 h.p.

THE ALBATROS D.III.

M. Jean Lagorgette in "L'Aèrophile" for June 15th, gives some interesting details of the Albatros single-seater fighter, new style, which is known as the D.III, or more commonly in the R.F.C. as the "V strut" type. The machine is the same as that seen in the famous photograph of Capt. Baron von Richthofen's "Circus."

This machine is a tractor scout type biplane, developed from the D.I 1916 model, described in THE AEROPLANE of March 21st, 1917, and from D.II. A number of examples, which had mostly been placed on service in February last, were captured in April.

The control surfaces, fuselage, landing-carriage, motor and armament (two fixed machine-guns firing forwards, with a synchronising gear), remain similar to those of types D.I and D.II. The three-ply wood of the fuselage is varnished a clear yellow, while the colour of the wings and control surfaces remains green and dark brown.

The differences, most of which are in the wings, are entirely inspired by the Nieuport biplane, of which this machine is a species of caricature, and causes danger of confusion. It is, therefore, the more necessary that the type should be studied carefully, apart from the importance of the machine itself.

As in the Nieuport the upper wings have no dihedral and are much greater in chord than the lower wings, which appear to be much thinner in every way, and are of a span nearly equal to the upper wings. The wings are staggered and have a single pair of struts in the shape of a fore and aft "V" on each side.

But the points of differences from the Nieuport are that the wings are not swept back, and that the outer edges are very oblique, giving the wings, whether viewed from above or below, a trapezoidal outline with rounded edges. The ailerons are markedly projecting and washed out.

Above all, the control surfaces are different. The large shovel-shaped fixed tail plane and elevator are entirely without break in outline. The fixed fin and rudder form an unbroken curve over the top of the fuselage.

The cabane is very spread out at the top. And finally, the fuselage—setting aside its colour—is different, being of monocoque form, with a revolving cowl in front, and an enormous projecting fixed motor, whose sound is quite different from the rotary.

The span of the upper wings is 9.03 m. (about 30 ft.) from the tips of the ailerons, 8.63 m. along the rear spar, and 7.55 m. along the front spar.

The span of the lower wings is 8.75 m. (about 29 ft.), each wing being 3.94 m., with an interval for the fuselage of 0.865 m.

The chord of the upper wings is 1.5 m. (about 4 ft. 11 in.) at the centre, increasing to 1.75 m. (about 5 ft. 8 in.) towards the tips, the depth of the ailerons increasing from 0.3 m. to 0.55 m.

The gap between the leading edges of the main planes is 1.5 m. at the fuselage and decreases towards the tips because of the dihedral on the lower plane.

The stagger is 0.22 m. between the upper and the lower leading edges, and is a little less than that between the trailing edges, in an inverse direction; thus the centre lines of the upper and lower wings nearly coincide when viewed from the side.

The interplane struts are "V" shaped, formed by two tubes soldered (or welded) together at the base, where they join the lower wing.

The bracing of the wings fore and aft is secured on either side by a cable running nearly horizontally between the nose of the machine and the bases of the "V" struts.

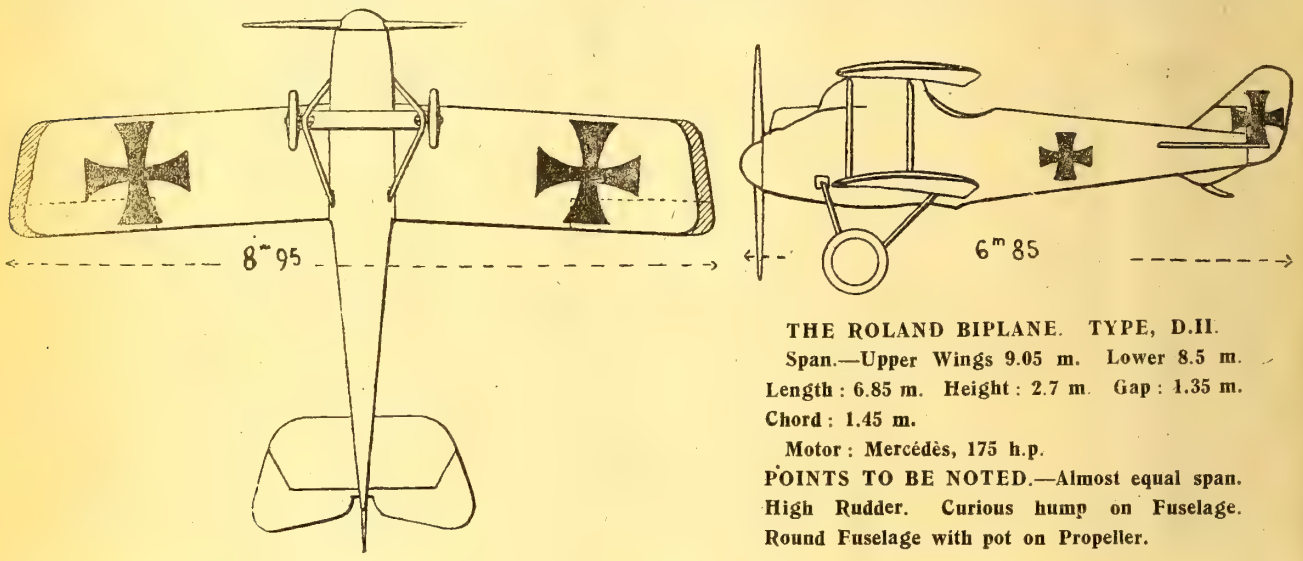
The main spars in the upper plane run continuously along the whole span. The centre of this plane has a semi-circular section cut away behind the rear spar, 0.48 m. deep by 1.35 m. wide, to allow the pilot to see upwards.

The fixed tail plane still has a chord of 1.62 m. and a span of 2.4 m. (including the width of the fuselage), and the elevator is 0.51 by 2.4 m.

The line of flight is 17 mm. above the middle of the third pair of longerons, which run along half-way up the side of the fuselage, and which support the horizontal stabilising plane.

As in D.II, the motor is a 175-h.p. Mercédès (No. 26,786, etc.), with an "Axial" propeller, 2.73 m. diameter, and a pitch of 2.20 m. The radiator, however, is now of the flat tube type, is placed in the upper plane, instead of honeycombs on the sides, and there is no longer a water reservoir on the motor.

The weight of the machine empty is 670 kilogs. (1,470 lbs.). The useful load, in addition to fuel, 135 kilogs. (297 lbs.).



THE ROLAND BIPLANE. TYPE, D.II.
Span.—Upper Wings 9.05 m. Lower 8.5 m.
Length: 6.85 m. Height: 2.7 m. Gap: 1.35 m.
Chord: 1.45 m.
Motor: Mercédès, 175 h.p.
POINTS TO BE NOTED.—Almost equal span. High Rudder. Curious hump on Fuselage. Round Fuselage with pot on Propeller.

THE ROLAND D.II.

The Roland single-seater fighter D.II is different in several respects from the Roland general purpose biplane.

The following particulars by M. Lagorgette are taken from D.II 878/16, recently captured by the French.

Its total length is 6.85 m., its height 2.7 m. The span of the upper wings is 9.05 m., that of the lower wings 8.5 m.

The wings are superimposed, and are not staggered, as in the two-seater.

The upper wings are attached to an upstanding projection built on top of and part of the fuselage.

Neither pair of wings has a dihedral.

There are two ordinary interplane struts on either side, constructed of steel tube, which give the planes a gap of 1.35 m., whereas in the two-seater there is a special strut of timber and three-ply, knife-edged, inclined, and very short (1.2 m.).

The wings are swept back, and of trapezoidal outline.

The ailerons, as in the two-seater, do not project behind the wings, and instead of their hinges being oblique to the axis of the machine, because of the swept-back wings, they are rectangular, and the controls are of pure Nieuport type.

The chord of the wing is 1.45 m. The angle of incidence is 2 deg. at the second rib from the fuselage, and 3 deg. at the seventh rib, next the struts, so there is a distinct "wash in."

The spars are of hollowed spruce, wrapped with thin flat tape. The front spars are 48 mm. by 85 mm., and the rear spars 52 mm. by 65 mm. Front and rear edges are of spruce, the rear edge being in three layers, the middle of which is cut out to admit the ends of the ribs. The outside edge of the wings is of ash.

The webs of the ribs are of poplar, with ash strips as flanges, certain of them being strengthened by a very heavy flange, with the web on one side, and not in the middle or doubled.

The vertical fin and the rudder have a rounded triangular outline, not unlike that of the single-seater Albatros D.III, but the rudder comes down behind the rear extremity of the fuselage for its whole depth, instead of being entirely above and in front of the tip of the fuselage, and the fixed fin is tucked underneath the overhang of the rudder, being reduced in area by just so much.

The horizontal tail members represent a rounded semi-hexagonal outline.

The elevator flaps, as well as the rudder, possess the "ear-shaped" outline of the early Albatroses and Rumplers, and they are all balanced by an angular portion projecting past the axis, as is now common German practice.

The fixed members are thick, built of wood and covered with three-ply.

The vertical fin is fixed permanently.

The fuselage, of relatively large size, is a true monocoque, round in section, with a revolving cowl in front of the propeller.

It consists as to the upper half of a species of inverted boat, or keel, of broad proportions, on the sides of which are fixed the wings, attached to two of the cross partitions of the fuselage. The lower planes fit into the sides of fixed wing-like projections on the fuselage which are permanently attached. This scheme follows the care manifested by Roland in avoiding "live" fittings, and rounding off all angles to the utmost.

The construction of the monocoque consists of very small longerons round which are placed bands of crossed veneer—in the manner of the Deperdussin—and the whole forms a single multi-ply structure, reinforced with layers of thin fabric.

The six layers of wood and the fabric have a total thickness of only a millimetre and a half.

The whole of the fuselage, together with the wings and control surfaces, is painted a green and brown colour.

The landing carriage consists of two wheels mounted at the points of two tubular "Vs," with a streamline cross axle of small diameter.

The motor is a Mercédès of 175 h.p., with an exhaust pipe sloping obliquely downwards, as in the Albatros single-seat fighter.

The radiator is placed in the upper plane, being 0.8 m. wide and without a V backwards.

Two synchronised Spandau machine-guns are fixed parallel inside the cowl, one on each side of the motor.

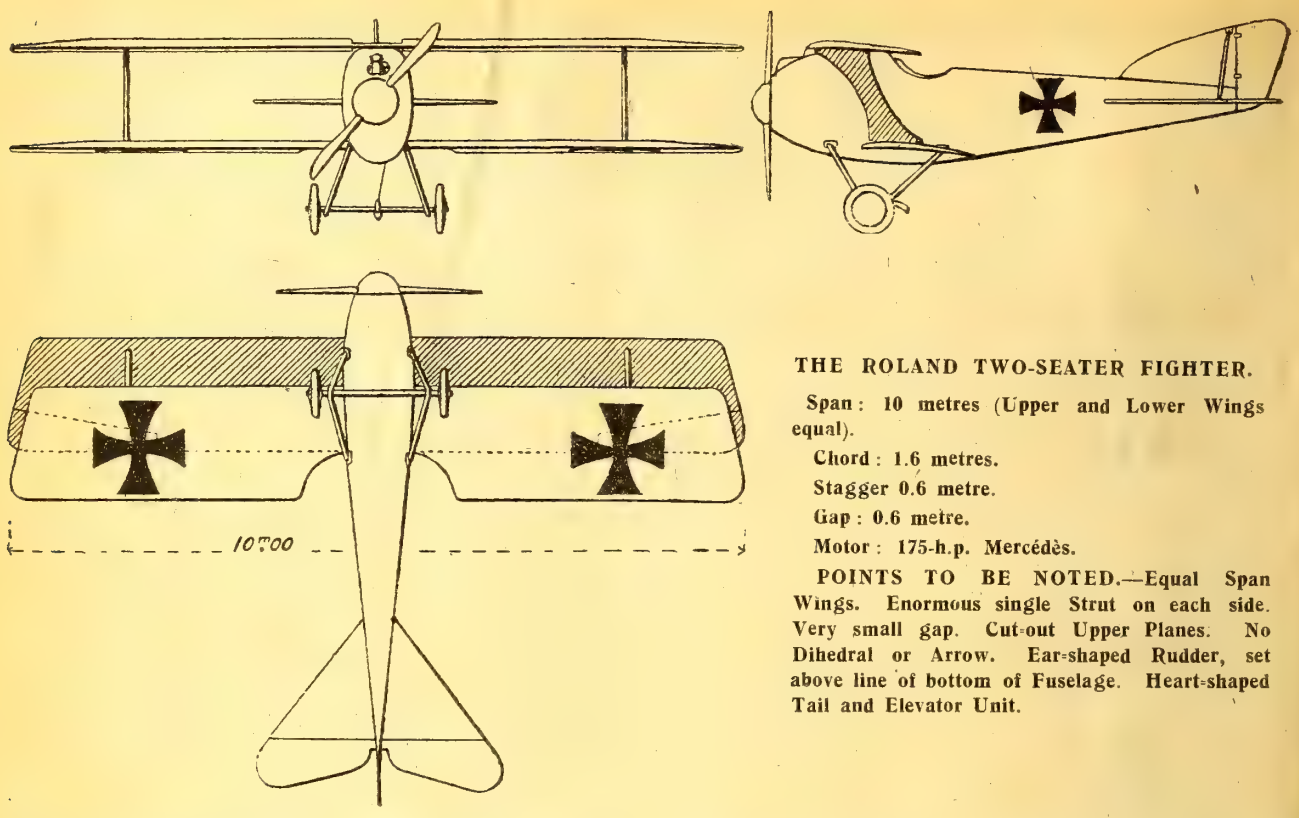
The control lever has two hand-grips, as in the Fokker.

The weight of the Roland, empty, is 660 kgs. (1,450 lbs.). The useful load, exclusive of petrol, is 167 kgs.

THE TWO-SEATER ROLAND BIPLANE.

Herr Roland was the engineer of the L.F.G. (Luft-Fahrzeug Gesellschaft). His two-seater is constructed on the same principles as the single-seater already described, but with various modifications.

Much smaller than other German two-seaters, it has only a span of about a metre greater than the single-seater, and, contrary to what one would expect, the wings, though of greater chord (1.6 m.), have a smaller gap, and a single strut, of streamline section, very deep, but short.



THE ROLAND TWO-SEATER FIGHTER.

Span: 10 metres (Upper and Lower Wings equal).

Chord: 1.6 metres.

Stagger 0.6 metre.

Gap: 0.6 metre.

Motor: 175-h.p. Mercédès.

POINTS TO BE NOTED.—Equal Span Wings. Enormous single Strut on each side. Very small gap. Cut-out Upper Planes. No Dihedral or Arrow. Ear-shaped Rudder, set above line of bottom of Fuselage. Heart-shaped Tail and Elevator Unit.

The span of the lower wings is equal to that of the upper wings. They are not swept back, nor is there a dihedral.

They are extremely heavily staggered (0.6 m.), which is all the more astonishing because the wings are so close together.

The front main spar of the lower wing is in a line perpendicular to that of the upper rear spar, and the flat strut which separates them forms a species of "X," inclined towards the front.

This "X" consists of a double layer of three-ply, which, except for a slight narrowing half-way down, between the two curves, fills up all the space between the four main spars, all of which it supports, and constitutes a strut of peculiar appearance, of which the fore and aft thickness at the base and summit is half the height. It is attached to the wings by four cups and balls.

The incidence is between 3 deg. and 4 deg.

The upper wings are attached to the top of the fuselage.

The main spars are enormous, and have much hollowing out. They are 0.6 m. apart, the rear one being in the centre of the wing.

The ailerons, which do not project, are of trapezoidal form, because their pivot is not perpendicular with the axis of the machine, but very oblique. They are operated by means of vertical cranks, which, as in the Nieuport, move a horizontal shaft inside the upper wing; but on this shaft, which cannot serve as an axis for the oblique ailerons, is fixed a pulley, which operates two cables linked to the cranks of the ailerons.

The Controls.—The mobile members of the controls, both rudder and elevators, have the ear-shaped outline of the 1915 Albatros. They are of tubular construction, although the fixed tail and fin are of wood. The ensemble of the elevators is heart-shaped, that of the rudder, including the end of the fuselage, is triangular.

The Fuselage.—This is a true monocoque, of round section, and so high in form (1.5 metre) that windows are let into the flanks, for the pilot and the passenger who sit behind him. Also, an empty space has been contrived above the pilot between the two upper wings, with four curved arms, crossing one another on the axis of the machine and joining the four spars, thus making a kind of horizontal cabane for the attachment of the upper wings to the fuselage.

The Landing-Carriage.—This is of ordinary type, consisting of two "Vs" of narrow streamlined steel tube, a cross-axle and a claw brake.

The motor is a 175-h.p. Mercédès.

There is a fixed machine-gun, and a machine-gun aft on a gun-ring.

Underneath the fuselage is a bomb clip with jaw release gear, for four bombs placed longitudinally side by side.

THE AIRCRAFT WORKERS' SPORTS.

The second annual sports meeting of the aircraft workers, which is to be held at Stamford Bridge on Saturday next, July 21st, at 3 p.m., promises to be a big affair. A full list of the events was given last week, and the following further particulars are now available. A Maori lady, Princess Iwa, will sing the National Anthem and Dr. Elgar's "Land of Hope and Glory," accompanied by the band "T" Division, Metropolitan Police, to which accompaniment the song is eminently suited. Her Highness Princess Helena Victoria has kindly consented to present the prizes. The "T" Division police band will play during the afternoon.

As noted last week, the price of admission is 6d.; covered seat in grand stand, 1s. and 2s. 6d. (including tax). Further information and tickets may be obtained from the Sports Secretary, Mr. J. T. Clark, Y.M.C.A., Tottenham Court Road, W.1., the sports being held under the auspices of the Y.M.C.A.

RECREATION FOR AIRCRAFT WORKERS.

The B. and P. Sports and Recreation Club occupies a prominent place in the activities of the workers in the Boulton and Paul Aircraft Works at Norwich. But they do not confine its benefits to themselves. On Saturday, the 21st inst., the Club is holding a sports meeting in aid of the British Red Cross Society (Norwich Division), when there is to be a long programme of athletic events for men and women, in addition to items described as "Old English," such as tugs-of-war, sack race, three-legged race, and slow bicycle race. But is a bicycle "Old English"?

WALDEN-HINNERS CO. ORGANISED.

The Walden-Hinners Co., of Edgewater, N.J., has been organised to build military types of land and water aircraft. The company is now constructing machines and is installing additional equipment for quantity production.

The association of Dr. Henry W. Walden with this company will recall some interesting details connected with the developments of aeronautics in this country. Dr. Walden began his experimental work in 1908. In 1910 he and Capt. Baldwin erected aeroplane sheds at Mineola, L.I. Dr. Walden was a contestant in the international races in 1911 at Nassau Boulevard, L.I. His monoplane was equipped with a 40-h.p. Hall-Scott engine, which drove it at a speed of 63 miles per hour.

The plant and property of the Walden-Hinners Co. is situated directly across the Hudson from Grant's Tomb, with easy access to water and railroad facilities. The capital stock of the company is owned by individuals composing the Walden-Hinners Co., and none of it is for sale.

The Production of Aeroplanes and their Components

(Sixth Instalment.)

BY STEPNEY BLAKENEY.

Wing Structure.

Having dealt at some length with the construction of the fuselage and chassis, we may as well consider the construction of wings. As the machine is a biplane, there are two right-hand and two left-hand planes and one centre plane to make. For the purpose of maintaining continuous progress in construction, we may as well commence with the centre plane, as this must be fitted up before the wings can be assembled on the machine.

The first parts to produce will be the two compression struts which take the end thrust of the main upper wing or plane spars. These will be of carefully selected rift, or vertical grain, spruce of the best quality, the dimensions of each being about 3 ft. 2 in. by 3½ in. by 2 in., lightened out on both sides on each side of the centre for about 8 in. This will leave the strut solid in the centre for about 6 in., the lightening being 11/16 in. deep by 2⅜ in. wide, the corners having about ⅜ in. radius to prevent splitting and fracturing at the corners.

Centre Section Spars.

The most suitable timber having been selected, it will be taken to the circular saw and cut down to 3 ft. 4 in. by 3⅝ in. by 2⅛ in. It is then advisable for the works inspector to see it. Assuming that he passes it, the next thing will be to put it through the planing machine, and reduce it to the correct size plus 1/32 in. full over all to allow for shrinkage. It will then be sent to the wood setter-out, who will, after referring to the drawings, set out the four lightenings, which will have to be carved out on the spindle.

If the spindle hand does the work carefully and has his cutters properly sharpened, there will be no need to sandpaper out the lightenings when it comes from the spindle. This can be done, and is done in works where the spindle hand knows his job and is not driven at his work by someone in authority whose sole aim in life is output from the department, regardless of finish.

Such forcing the pace amounts to nothing less than scamping the work. It costs the firm pounds, and delays final production. To say the least it should be severely dealt with, after a careful inquiry has been made of the spindle speed and the state of the cutters and the material they are made of. Also sandpapered work never has the same accuracy of finish as wholly machined work.

Having received the compression struts from the spindle, the next thing to do is to find the centre of the solid part between the lightenings and then mark off the extreme ends of the struts, not forgetting the fact that an additional amount must be left on the ends of the struts to enable the ends to be accurately cut to suit the dihedral angle of the wings. This angle is the upward slant of the wings towards the tips, and may be described as the angular space included between two planes which meet each other.

Further Steps.

Having completed the machining of the struts, the wiring plates should be put in position, and the position of the bolts marked off. Then the holes should be drilled, so that when the compression ribs at each end and the intermediate ribs are in position, the wiring plates can be put on and bolted to the compression struts, and the swaged wires fixed, and the tension adjusted.

However, before this can be done, the outside box ribs or compression ribs, and the three ordinary centre ribs, must be made.

Rib Making.

To make the ribs correctly to the contour and dimensions shown on the plan, it will be best to set out one on a thin hard wood board, and then cut and finish the board accurately to the shape of the rib. After which this template can be used to set out the jig board on which the ribs will be constructed and check finished. Ribs will be described later on.

To give an idea of the shape of the ribs which will be used in the construction of the wings and centre plane, we will assume that the length from the nose or leading edge to the trailing edge is 5 ft. 6 in. Therefore set out on the hard wood board, which will be the template of the rib, a straight line 5 ft. 6 in. long. This is called the chord line. The board should be not less than, say, 6 in. wide.

Setting Out Wing Curves.

The next thing to do is to produce the correct wing curves. On referring to the drawing we find that at about 6 in. from the left-hand end of the line a vertical offset of ¼ in. is given; therefore set up a fine line at right angles to the chord line across the board, and carefully cut in a mark ¼ in. above the chord line. This represents the curved line or underside of the rib at this point. Above this dimension is another, which we will say is 3¼ in., this representing the top curved line of the rib, and as we refer to the drawing, we find that in this manner a number of points in the top and bottom curved lines of the rib are thus given on the drawing, thus enabling the rib to be set out.

When all the points have been set out on the chord line and the vertical lines set up and the two points on each vertical line marked, all we have to do is to get two pieces of thin spruce about 6 ft. long by ⅜ in. wide by 3/16 in., and tack them down to the board, so that one cuts all the points nearest the chord line, and the other the points at the top, farthest away from the chord line. The space enclosed thus is the true and required outline of the rib; that is to say, if the given offsets are correct, which they are not always.

Assuming that they are, and that the dimensions have been accurately set out, all we now have to do is to cut in a fine line with a knife, carefully following the curves of the laths nailed down, on the inside. The enclosed piece of hard wood will then be cut out on the band-saw, and we must be careful to give instructions that all the points on the top and bottom curves are to be left in, so that they can be accurately worked down by the wood template maker. This gives the template maker sufficient latitude and material to ease off or soften any angular points in the curve which may arise.

After the template has been made it should be sent to the inspection department and carefully checked and then submitted to the A.I.D.

Ribs.

After it is passed and stamped it can be returned to the wood setter-out who will mark off the spruce webs for the compression ribs of the centre planes, which can then be tacked together four at a time, and sent to the band-saw, where they can be sawn out to within about ⅛ in. of the line. It is necessary for this amount to be left on by the band-saw, otherwise the spindle may not be able to finish them off clean.

On coming from the band-saw they will be tacked down to a template jig-board of hard wood, which is ¼ in. wide all round to allow for the projection of the spindle-cutter, and sent to be spindled in a canner similar to the method adopted in spindling the fuselage struts.

The Rib Jig.

After being spindled the webs will be sent into the wood parts department and the jig-board obtained from the wood template maker (see Fig. 11). The jig-board consists of a piece of hard wood such as beech, oak, or ash, about 1 in. thick, about 9 in. wide, and 6 ft. long. On this will be laid a piece of selected board, planed both sides, and cut to the exact contour

RIB JIG.

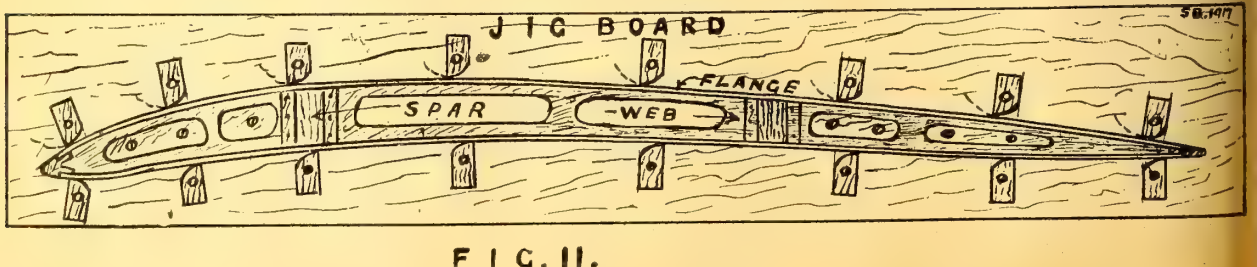


FIG. 11.

of the ribs less ¼ in. on the top and bottom edges, the ¼ in. being made up by the flanges on the top and bottom of the ribs. This board, or packing as it really is, will in this case be about 1⅜ in. thick, as the web may be assumed to be about ⅜ in. thick, with lightening holes in the centre and ends. The flanges we may assume to be about 1¾ in. wide. The 1⅜ in. packing will now be carefully glued and screwed onto the centre of the 6 ft. by 9 in. board, and on the top of this two short pieces representing the section of the spars will be carefully and accurately fixed in position. These pieces of wood are for the purpose of accurately locating the position of the web on the jig and checking the holes, which are cut out to allow the spars to pass through. Having got so far it will now be necessary to fix turn-buttons to the jig-board so that when the flange is bent to the curve of the rib, preparatory to being glued and screwed to the web, it may be accurately and permanently retained in this position until the rib maker has had time to put in the screws.

The next thing to do will be to cut two No. 5/16 in. slots right through the 1⅜ in. packing on the jig-board. These two slots are the locating positions of the two small vertical stiffeners, to strengthen the web and prevent buckling under load. The slots take the vertical stiffeners and hold them in position whilst the rib is being constructed.

Making up Ribs.

The rib-jig having now been constructed, the best thing to do is to make up one or two sample ribs, which must be submitted to the inspection department and if found correct sent to the A.I.D. for final inspection and approval. After which the construction of the required number can be tackled.

The method of procedure will be as follows:—Take two rib-stiffeners and place them in the slots made for them in the packing-board of the jig. Then take a web and lay it over the spar sections to locate it. After having glued the edge of the web-stiffeners next the web, fix the screws into these. Then take the top flange and slip it in between the web-edge and the turn-buttons, carefully cover with glue the edge of the web, then press the flange up to it and fix in position by turning the turn-buttons. Then with a suitable sized bradawl make the screw holes in the flange, about 4-in. pitch, and screw the screws in.

Some Points to Note.

Don't hammer screws in, as is done in many box and packing-case factories, for it is as well to remember that something is being made on which lives depend. Which, though it may not interest you, does interest the relatives of pilots.

Also it is best to see that the screws are put in straight, and at right-angles to the flange through which they are passing, especially if the screw selected is only just long enough for its job.

Also sharp screw-heads do not look nice when sticking up at all angles, and if you take the trouble to file them off, it, of course, weakens the heads, and possibly makes it impossible to remove the screw if it is at any time necessary.

Generally speaking, it shows that you are not up to the standard of work required in aeroplane construction.

Finishing Off.

Having properly put the screws in just slightly below the surface, the bottom flange may now be fixed in precisely the same manner, The rib can now be left for half an hour, if another jig is available, for the glue to set. At the end of this time the rib is ready for finishing off, sand-papering, etc.; this work, of course, being done by unskilled labour.

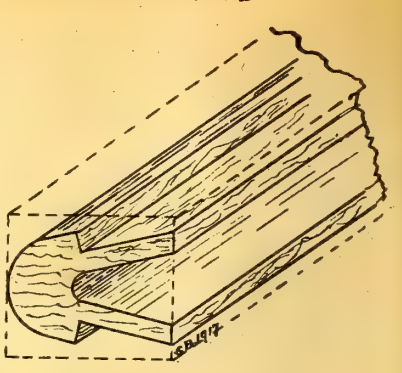


FIG. 12.

Ordinary Ribs.

The next ribs to put in hand will be the centre ribs, three in number. These will have precisely the same contour or curves, and, therefore, the rib template will be required again. But another jig-board must be prepared. This will be done in the same way, only as the web is only 5/32 in. three-ply, and the flanges about ½ in. by 3/16 in., with a 1/16 in. groove in the centre of one side to take the 5/32 in. three-ply, the packing piece on the rib jig-board will have to be reduced in thickness. This will allow the edge of the ½ in. flange to lie level on the jig-board and will ensure the flange being central with the web. To this it will be attached with 20 gauge by ½ in. long gimp-pins, and glued. The webs will, of course, have to be carefully set out as they are lightened in the centre and have also to have the holes cut in for the spars to pass through. Otherwise these ribs will be constructed in the same way as the end ribs.

The Leading Edge.

The next thing to put in hand will be the leading and trailing edges, which will be of ash, V-shaped, with a ⅜ in. radius at the small end of the V, and lightened out at the mouth of the V about ⅜ in. deep, allowing 3/16 in. thickness either side. The rectangular section of the ash required will be about 1⅛ in. by 1 in., to allow for cleaning up about 1/32 in. full and shrinkage.

The first thing to do will be to plane up a sufficient length of ash to this size and then spindle out the lightening, after which it may be cut in the spindle to its finished shape (see Fig. 12), leaving about 3 in. solid each end for additional stiffness.

(To be continued.)

THE CAMBRIDGE SCHOOL OF FLYING.

For quite a number of years the suitability of the Cambridge district as a flying centre has been mentioned from time to time, its geographical, or rather topographical, advantages being manifest. The country for many miles round is very flat, and natural facilities are offered for safe landings in every direction. It is rather strange, therefore, that the establishment of the first school of flying in the Cambridge district is of comparatively recent date, but it seems quite clear that the work of this school has received enthusiastic support.

The proprietors are the Cambridge School of Flying and Aerodrome Co., Ltd., who have acquired a fine aerodrome at Hardwick, with a surface of some 80 acres.

The school is well equipped with five Caudron type dual control aeroplanes, which are kept in good order by a staff of efficient mechanics. The works and school are under the control of Mr. Assheton Salton, formerly of the Northern Aircraft Co. of Windermere, and instruction is given by Mr. B. J. Curry, Mr. T. H. Drew, and Mr. W. S. Hardesty. Until recently the school was devoted entirely to the instruction of R.F.C. cadets, but with an increased staff and a larger number of aeroplanes available, the management are prepared to admit a number of civilian pupils for tuition. Special attention is to be given to those intending to enter the R.N.A.S. or R.F.C.

It is satisfactory to record that during the past six months no accident has occurred to any of the pupils. The aerodrome is open to inspection, and full particulars may be obtained by prospective pupils from 30b, St. Andrew's Street, Cambridge.

A NEW VENTURE.

Messrs. J. and S. Stean, of Bournemouth, an old-established firm of shop-fitters, are commencing work upon the construction of aircraft. They have taken over the entire machinery of the Worms Aircraft Construction Company of Twickenham, and have also secured the services of Mr. Max Worms, who has been responsible for the production in the past of some very fine aeroplane work. Mr. Worms will be in sole charge of the Aircraft Department, and one looks forward to the production of some very good stuff. The older firm were singularly successful in the manufacture of aeroplanes and parts, and Mr. Worms should find the high standard of workmanship to which the employees of Messrs. J. and S. Stean are accustomed a very great asset in his new work.

TECHNICALITIES.

The following notes deal with up-to-date workshop equipment, and will be followed (space and imagination permitting) by an A.B.C. version of the whole gamut of technicalities:—

Milling Machines.—These machines are chiefly used by apprentices during the period when they are cutting their technical teeth.

Planer.—As the name indicates, this is a device which elucidates the abstruse ideas of the engineers and draughtsmen, and makes them plainer.

Shaper.—This is a machine used principally in the training of apprentices.

Automatic Machines.—These are not absolutely necessary, but as girls do not masticate tobacco, a certain number of these are generally laid down, and experience shows that preference is given to those which deliver chocolates.

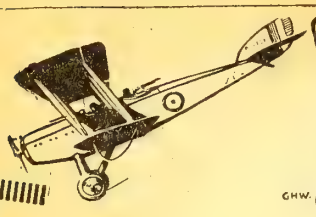
Slotter.—This machine is needed only in connection with the above-mentioned automatic or "Penny-in-the-Slot" machines; its use obviates the necessity of workmen carrying a large number of coins about with them.

Forge.—This is installed principally in workshops where the piecework system is the rule; its use saves the time of workmen signing tickets under this system, as this machine does it for them—hence its name.

Crankshaft.—A useful part of a machine for shops frequented by amateur inventors.

Vices.—These are common to all shops, and, therefore, need no explanatory remarks.

Benches.—These are put down for the use of tired workmen, and need not be so elaborate as those in Parks.



The Aeroplane

Acetylene Welding Plant—

Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—

Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation. Newcastle-on-Tyne."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2. City 7724.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.

Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."

Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."

Martinsyde, Ltd., Brooklands, Byfleet. Woking 331; Byfleet 171. "Martinsyde, Weybridge."

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455. "Nieuscout, Crickle, London."

Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."

Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerfyta, Knights, London."

Waring & Gillow, Ltd., Hammersmith. Museum 5000. "Warisen, Ox, London."

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

White, J. Samuel, & Co., Ltd East Cowes. Cowes 3. "White, East Cowes."

Airships—

Airships, Ltd., High Street, Merton. Wimbledon 1314.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, 'Phone, London."

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Bizfibild, London."

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.

The Wilfley Co., Ltd., Salisbury House, London Wall, E.C.2 City 2681-2. "Wrathless, Phone, London."

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Castings (Aluminium)—

Coan, R. W., 219, Goswell Road, London, E.C.1 City 3846. "Krankases, Isling, London."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."

London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."

Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."

B. D. V. Aircraft Spares, Syon Chambers, 16a, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—

British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."

British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Clarke, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Elastic Cords—

Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—

E. Kalker & Co., Coventry. Coventry 241. "Kalker, Coventry."

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford No. 1. "Pump, Bedford."

Arrol-Johnston, Ltd., Dumfries. Dumfries 281-182. "Mocar, Dumfries."

The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000.

Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. Gerrard 238. "Beardmore, London."

Dudbridge Iron Works, Ltd. (Salmson), 87, Victoria Street, London, S.W.1. Vic. 7026. "Aeroflight, Vic., London."

Gordon Watney & Co., Ltd., Weybridge. Weybridge 550 (7 lines). "Mercédès, Weybridge."

Green Engine Co., Ltd., Twickenham. Richmond 1293.

Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. Hammersmith 1910. "Gwynne, Hammersmith."

Sturtevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Moorfield, Wolverhampton."

The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W.. Walthamstow 408 (2 lines). "Elevenfold, London."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Flying Schools—

Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. Bournemouth 1160 "Etches, Winton."

Cambridge School of Flying & Aerodrome Co., Ltd., 30b, St. Andrews Street, Cambridge.

Galvanising—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Cowper-Coles Manufacturing Co., Sunbury-on-Thames. Sunbury 37.

Gears—

Moss Gear Co., Ltd., Thomas Street, Aston, Birmingham. East 407. "Mosgear, Birmingham."

Glue—

Adams & Co., Ltd., West Bromwich. Bromwich 264. "Reliance, West Bromwich."

Improved Liquid Glues Co., Ltd., Gt. Hermitage Street, E. (Croid.). Avenue 3178. "Excroiden, Wapp, London."

Mendine Co., 8, Arthur Street, E.C. Bank 5873.

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines). "Comyn, Ching, Westcent, London."

Chas. P. Kinnell & Co., Ltd., 65 & 65a, Southwark Street, London, S.E.1. Hop 372 (2 lines). "Kinnell, London."

Instruments—

British Wright Co., Ltd., 33, Chancery Lane, W.C.2. Holborn 1308.

Machine Tools—

Brewster & Co., 11, Queen Victoria Street, E.C.4. City 768. "Circumfuse, Cannon, London."

Magnetos—

The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. 2008-2009 Coventry. "Corlton. Coventry."

The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. Museum 430. "Vicksmag, Phone, London."

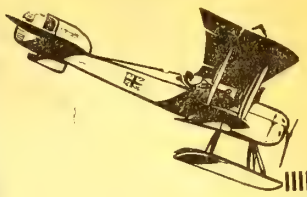
Metal Manufacturers—

Chas. Clifford & Sons. Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

Metals in General—

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Buyers' Guide.



Metal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."
Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."
Arnott & Harrison, Ltd., Blythe Road, Willesden Junction. Willesden 2297.
Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041. "Bayliss, Wolverhampton."
The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Foster Engineering Co., Wimbledon. Wimbledon 1800 (3 lines). "Fosteraco, London."
Mann, Egerton & Co., Ltd., Aircraft Works, Norwich. Norwich 482. "Motors, Norwich."
Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261. "Fremo, Birmingham."
Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."
Selsdon Engineering Co., Ltd., Croydon. Croydon 1761-123. "Selig, Cent, London."
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."
Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

Metric Bolts—

Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

Miscellaneous—

Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."
Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C. Central 3731.
Bowdon Wire, Ltd., Willesden Junction. Willesden 2400 (3 lines). "Bowirelim, Harles, London."
Brown Bros., Ltd., Great Eastern Street, E.C.1. London Wall 6300. "Imbrowned, Bethroad, London."
Edison Swan Electric Co., Ponder's End. (Lamps). Enfield 520 (6 lines). "Ediswan, Enfield."
Herbert Frood Co., Ltd., Chapel-en-le-Frith. Central 793. "Frodobrake, Birmingham."
Glasso Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.
London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—

Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
Standard Motor Car Co., Coventry. Coventry 530 (4 lines). "Flywheel, Coventry."

Observation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Packers, Shippers, Etc.—

Lep Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depolep, London."

Patent Agents—

King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.
Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.
Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Piston Rings—

British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—

Bliss, E. W., Co., 2a, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissdon, London."

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."
Integral Propeller Co., Ltd., Hendon 9. Kingsbury 104. "Aviprop, Hyde, London."
Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."
Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Stanley Aviation Co, 67, Kingsland Road, E.2. City 8347.
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—

C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. Chapeltown 474. "Instrument, Leeds."

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The Norman Thompson Flight Co., Ltd., Middleton, Bognor. Bognor 48. "Soaring, Bognor."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Short Bros., Rochester. Chatham 627. "Seaplanes, Rochester."
Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.
Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."

Shock Absorbers (Elastic Cord)—

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—

Forward Motor Co., Summer Row, Birmingham. Central 6259.
Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.
Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."
Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—

Dart Spring Co., West Bromwich. West Bromwich 322. "Dart, West Bromwich."
Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—

Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."
Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—

Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—

John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.
James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London."
R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."
The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Weskent."

Varnishes—

Clarke, R. Ingham, & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."
Harland, W., & Son, Merton. Wimbledon 45.
Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."
Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Watchmakers and Jewellers (Silver Models)—

Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—

Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."
London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—

Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wiremill, Musselburgh."
Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Woodworking Machinery—

Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."
Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."
Wadkin & Co., Leicester. Leicester 3614. "Woodworker, Leicester."

The Aeroplane Buyers' Guide.

Acetylene Welding Plant—
Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—
Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."
Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation, Newcastle-on-Tyne."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."
British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5552. "Caudroplan, Crickle, London."
Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.
Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2. City 7724.
Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.
Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."
Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."
Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."
Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."
Martinsyde, Ltd., Brooklands, Byfleet, Woking 331; Byfleet 171. "Martinsyde, Weybridge."
National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.
"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455. "Nieuscout, Crickle, London."
Norman-Thompson Flight Co., Ltd., Bognor Bognor 48. "Soaring, Bognor."
Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."
Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, 'Phone, London."
Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."
Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."
Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerfyta, Knights, London."
Waring & Gillow, Ltd., Hammersmith. Museum 5000. "Warisen, Ox, London."
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."
White, J. Samuel, & Co., Ltd. East Cowes. Cowes 3. "White, East Cowes."

Airships—
Airships, Ltd., High Street, Merton. Wimbledon 1374.
Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, 'Phone, London."

Aluminium Castings—
Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."
Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—
Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Bearings (Etonia Cast Phosphor Bronze)—
Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Fairby Construction Co., Ltd., 127, Victoria Street, S.W.1. Victoria 8868. "Bizfibild, London."
Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.
The Wiffey Co., Ltd., Salisbury House, London Wall, E.C.2. City 2681-2. "Wrathless, Phone, London."

Carburettors—
Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4070.

Castings—
Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Castings (Aluminium)—
Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—
Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—
Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."
London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—
Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.
Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."
Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.
Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—
Accles & Pollock, Ltd. Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."
B. D. V. Aircraft Spares, Syon Chambers, 16a, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."
Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."
The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—
MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—
British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."
British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."
Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."
Clarke, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Elastic Cords—
Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—
The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—
E. Kalker & Co., Coventry. Coventry 24x. "Kalker, Coventry."

Engines and Parts—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford No. 1. "Pump, Bedford."
Arrol-Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000.
Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. Gerrard 238. "Beardmore, London."
Dudbridge Iron Works, Ltd. (Salmson), 87, Victoria Street, London, S.W.1. Vic. 7026. "Aeroflight, Vic, London."
Gordon Watney & Co., Ltd., Weybridge. Weybridge 550 (7 lines). "Mercédès, Weybridge."
Green Engine Co., Ltd., Twickenham. Richmond 1293.
Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. Hammersmith 1910. "Gwynne, Hammersmith."
Sturtevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.
Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Moorfield, Wolverhampton."
The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W. Walthamstow 308 (2 lines). "Elevenfold, London."
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Flying Schools—
Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. Bournemouth 1160 "Etches, Winton."
Cambridge School of Flying & Aerodrome Co., Ltd., 30b, St. Andrews Street, Cambridge.

Galvanising—
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Cowper-Coles Manufacturing Co., Sunbury-on-Thames. Sunbury 37.

Gears—
Moss Gear Co., Ltd., Thomas Street, Aston, Birmingham. East 407. "Mosgear, Birmingham."

Glue—
Adams & Co., Ltd., West Bromwich. Bromwich 204. "Reliance, West Bromwich."
Improved Liquid Glues Co., Ltd., Gt. Hermitage Street, E. (Croid.). Avenue 3178. "Exeroiden, Wapp, London."
Mendine Co., 8, Arthur Street, E.C. Bank 5873.

Goggles—
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Heating and Ventilating—
Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines). "Comyn, Ching, Westcent, London."
Chas. P. Kinnell & Co., Ltd., 65 & 65a, Southwark Street, London, S.E.1. Hop 372 (2 lines). "Kinnell, London."

Instruments—
British Wright Co., Ltd., 33, Chancery Lane, W.C.2. Holborn 1308.

Machine Tools—
Brewster & Co., 11, Queen Victoria Street, E.C.4. City 768. "Circumfuse, Cannon, London."

Magnetos—
The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. 1908-1009 Coventry. "Corlton, Coventry."
The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. Museum 430. "Vicksmag, Phone, London."

Metal Manufacturers—
Chas. Clifford & Sons, Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

Metals in General—
Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Metal Parts and Fittings—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."
Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."
Arnott & Harrison, Ltd., Blythe Road, Willesden junction. Willesden 2297.
Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041. "Bayliss, Wolverhampton."
The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Foster Engineering Co., Wimbledon. Wimbledon 1800 (3 lines) "Fosteraco, London."
Mann, Egerton & Co., Ltd., Aircraft Works, Norwich. Norwich 482. "Motors, Norwich."
Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261. "Fremo, Birmingham."
Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."
Selsdon Engineering Co., Ltd., Croydon. Croydon 1761-1231. "Selsg, Cent, London."
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."
Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

Metric Bolts—
Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

Miscellaneous—
Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."
Anti-Glare Glass Co., Ltd., 76, Turnmill Street, E.C. Central 3731.
Bowden Wire, Ltd., Willesden Junction, Willesden 2400 (3 lines). "Bowirelim, Harles, London."
Brown Bros., Ltd., Great Eastern Street, E.C.1. London Wall 6300. "Imbrowned, Bethrood, London."
Edison Swan Electric Co., Ponder's End. (Lamps), Enfield 520 (6 lines). "Ediswan, Enfield."
Herbert Frood Co., Ltd., Chapel-en-le-Frith. Central 703. "Frododrake, Birmingham."
Glasso Manufacturing Co., Ltd., 211, City Road, E.C. City 0558.
London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—
Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
Standard Motor Car Co., Coventry. Coventry 530 (4 lines). "Flywheel, Coventry."

Observation Panels—
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Packers, Shippers, Etc.—
Lep Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depotep, London."

Patent Agents—
King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.
Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.
Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Piston Rings—
British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—
Bliss, E. W., Co., 22, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissdon, London."

Propellers—
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."
Integral Propeller Co., Ltd., Hendon 9, Kingsbury 104. "Aviprop, Hyde, London."
Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."
Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Stanley Aviation Co., 67, Kingsland Road, E.2. City 8347.
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

Rigging for Aircraft—
Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—
The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—
C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—
Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—
The Foster Instrument Co., Letchworth, Herts. Chapeltown 474. "Instrument, Leeds."

Seaplane Manufacturers—
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The Norman Thompson Flight Co., Ltd., Middleton, Bognor Bognor 48. "Soaring, Bognor."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Short Bros., Rochester, Chatham 627. "Seaplanes, Rochester."
Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—
Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Sheet Metal Pressings—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.
Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."

Shock Absorbers (Elastic Cord)—
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—
Forward Motor Co., Summer Row, Birmingham. Central 6259.
Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4070.
Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."
Ripault, Leo, & Co., Ltd. (Oleo Plugs), 642, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—
Dart Spring Co., West Bromwich. West Bromwich 322 "Dart, West Bromwich."
Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—
Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."
Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—
Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Steel Tubes for Aeroplanes—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—
Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—
John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.
James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—
Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London."
R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—
Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—
The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."
The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Westcent."

Varnishes—
Clarke, R. Ingham, & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."
Harland, W., & Son, Merton, Wimbledon 45.
Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."
Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Watchmakers and Jewellers (Silver Models)—
Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—
Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—
Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."
London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—
Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wirenill, Musselburgh."
Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Woodworking Machinery—
Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."
Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."
Wadkin & Co., Leicester. Leicester 3614. "Woodworker, Leicester."

A Peace Time A.I.D.

By Douglas C. Hutchinson.

In the face of the Editor's mild reproof against the discussion of peace problems during war, I would strongly urge the extension of the work of the personnel of the A.I.D. to commercial uses in peace time. And as an excuse I would point out that it is easier to translate a working department from one sphere of activity to another than it is to revive one that is in a moribund condition, which might become the condition of the A.I.D. after the conclusion of the war. Also it would be very foolish to allow both the individual and collective knowledge of aircraft instruction acquired by this Department to be lost to the Aircraft Industry.

I am quite sure that though, in some cases, the inspection of material has become irksome to manufacturers, there has been a considerable amount of good done by this Department, and it is certain that they have put in hard and intelligent work, and the officials at Headquarters are to be congratulated on their efficiency.

Control and Inspection of Transport Vehicles.

I propose to deal with the subject very broadly. Looking at the question from the point of view of the general public, it is obvious inspection of machines destined for human transport is an absolute necessity. Can one imagine, for instance, the delightful state of London streets if motor omnibuses and taxis were not under stringent supervision? I believe I am quite correct in stating that there are more accidents in connection with public transit in America than in this country, which is largely due to the fact that their form of locomotion is apt to trend towards speed rather than safety. One does not quarrel for a minute with speed; the rate at which we are living at present encourages it, but there is no reason why every care should not be taken in manufacture of the means of locomotion, to eliminate as far as it is possible risks of catastrophe from faulty material.

I do not suggest that it would be practical to continue the rather far-reaching form of inspection at present in vogue, but it could be carried out somewhat on the following lines.

Companies engaged in the construction of aircraft should notify the Inspection Department—which I shall term "Aeronautical Inspection and Licensing Department," and which would be, in fact, an Aerial Board of Trade and Lloyd's Register of the Air combined—that they intend to construct aircraft for commercial purposes, and to apply for an inspector or inspectors to be stationed at their works.

They, the manufacturers, should be subjected to a charge for their licence which would, to some extent, defray the cost of inspection.

It would also be practical, I am sure, for such manufacturers to supply to this Department a list of other manufacturers from whom they propose to draw their supplies of material for the manufacture of complete machines. In each such case, of course, three or four suppliers of similar articles could be indicated, in order that the aircraft constructors should not be subjected to high prices through lack of competition. These supplies of raw materials would also be under inspection on similar lines.

Unrestricted Output.

It has been suggested to me that this inspection I propose would restrict output. I fail to see why it should, inasmuch as the inspectors would not be concerned with questions as to whether the builders of aircraft follow official specification regarding the construction or design of different components, but simply would concern themselves with the quality of the material employed.

One naturally might argue here that after all the design of the machine is the principal factor of safety. Granted; but I also propose that not only should the material be inspected, but every machine must be tested in the air by the company's own pilot before being handed over to be stamped as passed by the A.I.D., and, perhaps, to make this safeguard even more certain, someone might like to suggest, no doubt, that the designer and managing director of the company should be passengers in such flights.

It can be assumed that every manufacturer would have good stocks of various material or parts for use which the inspector would have inspected before they were actually wanted for use in the machine. He would constantly be about the works, and could very soon detect any faulty workmanship in assembling.

Licences to Build.

Another point that is of great importance from the manufacturer's point of view is that this system of applying for licences for manufacture should be of benefit to the manufacturers, inasmuch as it would eliminate jerry-builders, and I fail to see how the fact that their machines having the official approval of such a peace-time A.I.D. can be anything but an asset to the aeronautical transport companies, if only by reason of the confidence it would give to the public.

Anti-Smuggling Guarantees.

Let us take another view of the advantage that this proposed Department will be to the Aircraft Industry, or rather to that portion building machines for cross-channel purposes. One must consider the say that the Customs and Excise Department will have in this matter of aerial navigation.

Take, for instance, the zealous officer who, on arrival of the 8.45 Paris-London 1,500 h.p. Footley-Leaf—let us say—immediately commences to probe the wings, and saw through the longerons looking for smuggled saccharine, besides letting out the air from the tyres of the landing wheels and other playful tricks beloved of such officials. The activities of this gentleman will largely be toned down if the Customs Department, working in harmony with the A.I.D.—[If any two Departments can work in harmony.—Ed.]—are assured by seeing the A.I.D. official stamp on the main parts that they are what they appear to be, and are not devices for the carrying of excisable goods.

Further Duties.

The Department would compile a register of all machines British or foreign, public or pleasure, using aerodromes in this country, and unless such machines were registered in such a manner they would be, immediately on landing in this country, interned pending investigation of their bona fides, a precautionary measure on which it is hardly necessary to enlarge.

This Department might also compile, by means of advices from the Government's agents abroad, a fairly complete register of foreign machines confining their flights to their own countries or the Continent.

Again, the statistics compiled by this Department would be of inestimable value in future wars, that is, provided we live to see the end of the existing one.

Internal Reform.

Presumably, the personnel, and also the method of dealing with the inspection question, would require re-organisation and modification, but it does not seem to me to be unpractical for the Department to allow their methods to be examined by two or three business men in the aircraft trade, who would, no doubt, be able to draw up a very efficient organisation suitable for the purposes suggested in this article.

Another point that has occurred to me is that there are a considerable number of articles used in the manufacture of aircraft which need not be inspected at all, and, therefore, it will be necessary for representatives of the aircraft industry to determine for themselves, in conjunction with some chief officials of the A.I.D., which articles are most in need of inspection, that is to say, which are those more liable to develop faults that would be dangerous to passengers.

I may be quite wrong, but will take two cases only; for instance, fabric and timber. There must undoubtedly be a great risk of weakness through faulty weaving. Such weakness perhaps would not be noticeable unless it were subjected to inspection, and the effect of any such flaw would be a catastrophe in the air. Again, in the case of timber, many faults may occur without being immediately noticeable, especially in the stress of commercial building, where dividends are more to the fore than any other time.

A Disclaimer.

Probably I shall be accused of impugning the honesty of aircraft constructors by even suggesting that their work should be inspected in peace time. Of course, we all know that dividends are never dreamt of by directors of aircraft concerns, and that they are really philanthropists.

So far I have not suggested any procedure in connection with Admiralty inspection. This must be left entirely to the Admiralty, as their inspection will only be in connection with machines for fighting purposes. Fighting machines built by contractors for the War Office would be possibly dealt with by the suggested A.I.D., only with, no doubt, a more stringent form of examination than I am advocating, but the Naval or Army inspection is a question that can only be dealt with by the Military Departments, and they should have naturally first call on personnel, material, and method.

On one occasion I was accused of being like the typical man from Missouri, who must see to be convinced, and that is the reason I consider that the inspection stamp on a machine will be proof to the travelling public that it is as safe as can be. Apropos of this need for conviction, the man who accused me of coming from Missouri came to me at an hotel in New York, suggesting that as he had a very valuable idea to place, would I advance him his steamboat fare and expenses across the Atlantic. On seeing that I was rather unresponsive, he suggested then that I might at least contribute something toward it, as he had very many wealthy friends on this side who would reimburse him for his expenses. As I thought he probably would have some difficulty in even raising his car fare down to town, I then again

jibbed; then he came down to sufficient for a cable, but on my offering to send the cable off for him he hurriedly left.

THE APPLICATION THEREOF.

The question of the system is one that must be left to the chief officers of the present A.I.D. to advise upon, as they no doubt have a very effective method, and it would be probably quite easy for a small committee of inquiry to apply these methods to commercial aviation.

Perhaps I have not made this article as clear as might be possible, but I hope that I may have suggested an idea which will be advantageous to the public and the industry.

To digress from the subject a little, I should like to hear that a lecture is to be given by someone who is not perhaps an Air enthusiast, but who could put the future of aviation in a simple manner such as would be convincing to the proverbial "man-in-the-street." Public interests would be aroused where, as at present, there has been a tendency to discuss the aviatic future with a certain amount of latitude and with our rather national failing of looking broadly into matters and letting the details look after themselves.

That very excellent lecture given by Mr. Holt Thomas some few weeks ago portrayed the future very nicely, but I do not think that it would have drawn many shareholders to the fold had Mr. Thomas been considering company promoting, and although I know that Mr. Holt Thomas had no such intention, but merely to give an idea of possibilities, after all, business people must know facts.

MARKET REPORTS.

Prices given are for quantities on usual terms.

July 11th, 1917.

COPPER.—The position of the Copper market remains unaltered and there is a very marked dullness at the present time. The position in the United States is unsettled, due, primarily, to the rumour that the Federal Trade Commission intends investigating the costs of production, and fixing prices on the basis of their figures.

Supplies here are quite sufficient for national requirements:—

Current Prices.

Copper Ingot (Standard), Cash...	£130 per ton.
Copper Sheet	£165 per ton.
Copper Tube	20½d. per lb
Brass Sheet, 24 Gauge	16½d. per lb.
Brass Tube, S.D.	17d. per lb.

TIN.—The Tin market is still in a very erratic condition, and supplies are very uncertain. Furthermore, there is a strong opinion that America will become a large buyer.

Certain parties are endeavouring to make Tin a Government controlled metal, with the object of securing a reduction in prices. There is, however, very little possibility of their efforts meeting with success. The price advanced against last week, and under present conditions it is difficult to say what fluctuations are likely to occur.

Comparative Prices.

To-day	£246 0 0
Last week	£242 15 0
Last month	£239 10 0
Highest price last year	£205 0 0

STEEL.—The chief interest centres round the question of supplies, and, although there has recently been a hopeful feeling that the situation would become much easier, there is still an abnormal conjestion of outstanding orders. When America entered the war there were great expectations that large shipments of Billets would be received from there, but there is a general disappointment because there has been no increases whatever. U.S.A. prices still remain extremely high, in fact, they are more than double the prices charged here. As far as we can see at present, the position can only be improved by English makers effecting a colossal increase in their outputs. This is still being done, and for the present buyers are keenly alive to the present shortage of supplies, and are looking well ahead.

The Air Board are gradually taking control of all supplies of Aircraft Steels, and are organising a Clearing House in Sheffield, from which, it is presumed, supplies will be distributed. This should help matters, but it remains to be seen what the ultimate results of this step will be.

Prices have not fluctuated and the market continues firm.

Current Average Prices.

R.A.F. 3B Steel, 38s. to 40s. per cwt., Basis.
R.A.F. 1E Steel, 78s. to 80s. per cwt., Basis.
R.A.F. 9A Sheet Steel, 32s. to 33s. per cwt.

ALUMINIUM.—There has been no change whatever in prices and supplies are fairly good.

Current Official Prices.

Ingot	£225
Remelted	£210

LEAD.—The price of Lead remains unaltered, but there is a little more hopeful feeling that supplies will improve. The Spanish situation is reported to be improving, and American production is on the increase.

Official Prices for Soft Foreign Pig.

£30 10s to £29 10s.

TIMBER.—There has been very little Silver Spruce landed during the past week, and the outlook is not at all bright. A fairly good quantity of Mahogany has arrived, but not nearly as much as we should like to see.

As stated previously, the Admiralty have supplies of Silver Spruce, Mahogany and Walnut, and application for any material must be made on the official application form, which can be procured from the Department of Aeronautical Supplies, Air Board Office, Strand, W.C.2.

We understand that great stocks of Spruce are lying in Canada waiting to be shipped, and merchants fail to understand why the Government do not allow the wood to be shipped in sailing vessels, which are practically of no use whatever for Government work.

With the market in such an uncertain condition it is only natural that prices should remain firm, and there is not much hope of an improvement yet.

Current Average Prices.

Silver Spruce, 17s., c.f.
Mahogany, 2s. 2d. to 2s. 4d., s.f.
Walnut, 2s., 3d. to 2s. 6d., s.f.
English Ash, 13s. 6d. to 15s., c.f.

Prices are for selection and delivery.

FABRIC.—We fail to understand the workings of officialdom, and if other aircraft materials are not controlled better than Fabric, there will be endless confusion. Several manufacturers received a notification last week that the price of Linen Fabric would be 2s. 8d. per yard. In the first place they were not informed if the price is for 36 in. or 38 in. wide; then, again, why were they previously informed that the price would be 2s. 5d. per yard, 36 in. wide, and 2s. 7d. per yard, 38 in. wide? The material has now been under Government control about six months, and we presume they will commence charging the aircraft firms with the material already delivered when they have made up their mind what the prices will be. In the meantime supplies are coming through fairly well.

A TRIBUTE TO AN AMERICAN ENGINE.

Mr. N. B. Robbins, instructor in the Army School at San Diego, Cal., states in a recent letter that the 8-cylinder, V type, "OX" Curtiss engine used by him has run officially for 127 hours without overhauling. He added that he expected to get from 150 to 175 hours' flying service out of the engine without taking it out of the machine. Mr. Robbins writes:

This engine I refer to is in machine No. 157—Curtiss JN used for training by myself. Is now in perfect working order. Turns the propeller now at 1,425 r.p.m. I believe I would be safe in saying that the average is about 1,400 for this type and size engine. Some time ago a Congressional committee visited the school and we flew in review with about 20 machines. On this trip I piloted my machine without student, and attained an altitude of 3,700 ft. in just 7 minutes, this with the engine referred to, and at that time it had run about 100 hours.

This bears out the remarks made in an editorial recently upon the dogged reliability of the Curtiss aeroplanes and engines, and also points to the low rates of climb with which American aviators are accustomed to be satisfied.

ROTAX PROGRESS.

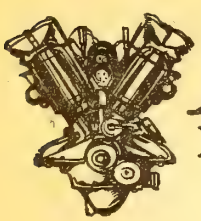
It is of interest to note that the business of H. T. Saunders and Co., Ltd., Lozells, Birmingham, has been acquired by the Rotax Motor Accessories Co., Ltd., and will be carried on as a branch works under the name of the Rotax Brass Works, 85, Clifford Street, Lozells, Birmingham. As a matter of fact, a working arrangement has existed between the two firms for some years. All communications, however, should be sent to the head offices of the Rotax Motor Accessories Co., Ltd., at Willesden Junction, N.W.10.

DECORATIVE ART.

Officers' messes in the R.N.A.S. and R.F.C. who wish to add a little local colour to their premises by acquiring pictures of their favourite or most loathed aeroplanes would do well to communicate with Mr. Geoffrey H. Watson, an artist who is fully competent to produce in black and white or in water colours pictures of aeroplanes, which are not only technically accurate, but also on most artistic lines.

Many pictures from Mr. Watson's brush have appeared from time to time in THE AEROPLANE, but, of course, the originals are much more striking.

Upon receipt of particulars of requirements Mr. Watson will be pleased to submit estimates and to carry out commissions expeditiously. His address is 48, Longridge Road, Earl's Court.



AERO-MOTORS

IN KIND AND CONSTRUCTION

By Geoffrey de Holden-Stone

Mixed Truth.

How beautiful upon the linotypes are the hands of them that follow copy. Their faithfulness, self-restraint, and sheer instinct are wholly marvellous, and great shall be their reward—some day. I can never repay the debt I owe them. So I am not going to try. I always put that sort of thing up to the management.

Yet, sometimes I wish they wouldn't. As when, by blind perperversity, I write one word and mean its exact opposite. Thus of the outer piston I wrote "in each case," whereas "each" should have been "one." Hence possible misunderstanding.

That one case is the other hidden treasure, wherein said piston is of the differential charge-pumping type. As in the Laviator and half a dozen others hereinbefore duly set forth. Also, in a later variation of the Chadderton design, and another in projection. So as this is the best way to turn the otherwise useless end of a piston to frictional account in the two-stroke cycle—and in the ideal fashion of adding no new part—I might well write "naturally."

But it does not happen to be so in the original Chadderton model now under review. I should imagine that a sound opportunity had been missed here. Still, my own predilections might well lead me wrong, nevertheless. For, in the first place, deference to the side elevation will show that the lower cylinder enlargement is merely a sort of cross-head slide. Secondly, the special Chadderton cycle ordains otherwise, for the time being.

The particular principle of this cycle it will be remembered, is that not only shall there be no explosive mixture in the crank-chamber, but that none shall reach the combustion space between the pistons before the moment of combustion: that moment, of course, being reckoned with due allowance for the advance or delay of the actual ignition.

The Chadderton Induction.

How this is done will be seen—albeit not too clearly—from the sectional illustration on this page. This shows that the air for the mixture is first drawn through the front end of the crank-shaft into the crank-chamber, by the suction of the under side of the inner piston. As, for instance, in the Day or Smalley-type two-stroke cycle. Then that, during the piston outstroke, the air is compressed—internally of the motor—into some sort of pressure tank or container. Though how, or by what exit or other means is neither illustrated nor explained, and I am no good at riddles. The stated pressure, at any rate, is some 75 lbs.: which, incidentally, is also employed for starting.

But accepting the evidence of things not seen, it will, nevertheless, be clear from the illustration that the compressed air can come back as stated, through the special carburettor employed—also not shown—by way of the tubular axle on which the motor rotates. Also that it passes through certain perforations into an annular distributing chamber, and thence is delivered through induction piping to the main inlet passage of each cylinder by way of an a.o. non-return valve.

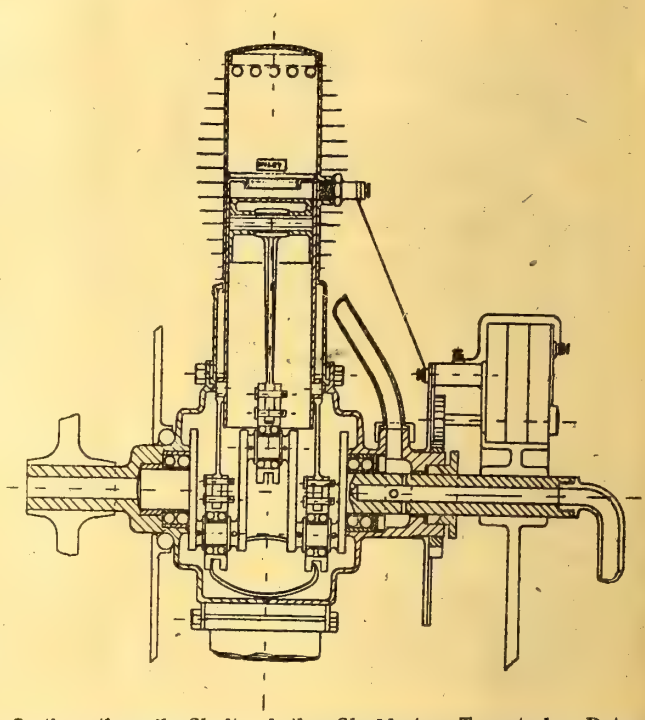
Certain Mechanical Defects.

Here, if one may criticise frankly, the latter mechanical part of this induction scheme is not promising. In fact, it is wholly at variance with the soundest experience of two-stroke practice—to say nothing of its ideals—which has long ago proved a.o. poppet valves to be deadly things. The mere fact that they must act twice as fast as in four-stroke practice—where they were bad enough—disqualifies them. So much so, that their least failure—which may be perpetually expected—suffices to put the running of the motor all wrong.

Yet, in the later variation of this design, actually two of them are embodied! Beside this, that acute-angled bend in the head of the induction piping, appears but a minor defect. Indeed, were it not for the originality and unusual merit of the design in other and more fundamental respects, and the possibilities of eliminating these valves altogether, which may be discerned, one would almost condemn it on their account. Truly, their notorious unreliability would counteract all the safety intended to be assured by the special principle of the Chadderton cycle. After all, if a motor is likely to quit working at any moment through valve-failure, the merit of its immunity from taking fire would almost be lost sight of.

And Physical Possibilities.

On the other hand, on this account alone, the Chadderton induction principle should be of extraordinary value. Subject, of course, to the novel carburation methods it involves, proving



Section through Shaft of the Chadderton Two-stroke Rotary Motor.

reliable—for which reason exhibition of the carburettor design, so far withheld, would be interesting—and to the charging of the cylinder being duly effected as claimed.

However—even though taking nothing for granted—there seems little reason to doubt the latter result. The pressure—which could hardly fall much below 65 lbs. between container and cylinder—should be more than sufficient for forced induction, as well as to operate the annular two-way valve as effectively as it has been claimed to do, and to charge the cylinder with all the essential rapidity. Also, the fact that this valve remains open, providing the exhaust-gas relief to atmospheric pressure, during the entire instroke of the outer piston, should materially assist this result. And finally, there appears to be nothing mechanical or physical, to prevent this induction system being applied to any type of motor radial, vertical, or V, otherwise embodying the Chadderton design and general features.

Nevertheless, the existence of such a pressure as a fundamental feature of its working, furnishes a conclusive argument, not only for valvelessness, but also for the elimination, as far as possible, of piping and possible leakage points; in fact, for the embodiment of all induction conduits within mass-parts, instead of externally.

How the Valve Works.

Coming now to the question of how the channel-shaped, pressure actuated dual valve works, the question of the relative position of the two port-series has only been dealt with to the extent of stating the desirable remoteness of initial entry from final exhaust. The rest of it is not so much whether the valve would work with the position reversed, as how it works as it is.

As shown, this valve is at the end of the exhaust period; that is, the instroke. Now it is just in this respect that one of the chief differences between the Chadderton cycle and other two-strokers—even the one nearest alike—is constituted. In these latter there is nothing approaching "a period"—in the four-stroke sense—for any phase but compression and working, or more than a small portion of any stroke for induction and exhaust. In the Chadderton cycle, on the contrary, the exhaust occurs at the end of the outstroke, and continues to the end of the instroke, of the outer piston.

Some Special Circumstances.

This certainly secures, not so much scavenge for anything but the products of complete combustion, as pressure relief. So

that there shall be no back-pressure against the subsequent induction; which—to pay for the length of the exhaust—has a shorter time for entry than in any other two-stroke cycle. So short indeed, that it is actually a charge injection, at such a necessarily high-pressure as 75 lbs. instead of the desirable 15 lbs. of ordinary transference. Hence the necessity for the most ample port area; wholly located furthermore within the restricted range of valve and piston travel during that brief charging moment. Hence also the extreme value of this particular valve design, with its great width and unbroken circle of port-series. Which thus comes nearer the i.c. ideal of the opening and closing pot-lid than any other.

And Reasons Why.

But the point is, how is it all done? How, in the first place, is that channel-valve held locked during the entire working-stroke? Solely by the pressure occurring: which acts through the inlet ports, and upon the top or horizontal part of the channel-valve, to hold it down and thus keep the exhaust ports closed with its deeper inner vertical flange. At the same time, no escape can take place through the inlet ports to the charge entry, because the outer flange-extension of the combustion chamber—enclosing the valve—closes off escape everywhere else: and the entirely closed entry cavity in the top corner of the piston on the left, has run upwards beyond the entry passage. So that the cylinder-wall prevents any loss of pressure. At the same time it will be noticed that the trunk of the outer piston itself has cut out the entry passage, and prevents any leakage of the oncoming charge into the exhaust chamber above, irrespective of its pressure: thus rendering that a.o. non-return valve wholly superfluous.

Results: and some Conclusions.

In any case it will be obvious that with the internal pressure itself holding the valve closed, and with no external means of opening it, not only will the M.E.P. be maintained to the maximum, but that it cannot be opened until the last of the combustion effort has expired. What this should mean in efficiency, especially in a long-stroke motor, need not be elaborated, provided always that no slowing effect is produced.

Now, of course, the exhaust is due to begin, so how is the valve supposed to be opened? In the case of a rotary motor the weight of the valve, acting centrifugally and tangentially, should suffice, as claimed, for the initial lift; after which the exhaust blow would be quite enough to hold the valve open during the instroke, until the internal pressure was wholly relieved. By this time, however, the piston cavitation has come into coincidence with the induction entry passage. and the induction pressure, working upon the top of the valve, snaps it down to close off the exhaust ports, and the combustion chamber is immediately filled through the inlets.

But here I am inclined to maintain the possibility—though the means concern no one else—that the mere fling of the piston could be made to effect this result, as soon as the combustion effort had died out, in any type of motor, a V as well as a rotary or radial. Also that the assumption to the contrary is far from obvious; notwithstanding even the assertion of the author of the cycle!

(To be continued.)

THE PATENTS INDEX.

The subjoined list of recent inventions has been specially compiled by The Aeroplane from the current Official Patents Records:—

Patent Applications.

Billinton, H. L. Interrupter gear to fire machine-gun on aeroplane. No. 9512. July 3rd.

Bowen, E. W. Road or aerial vehicles. No. 9507. July 3rd.

Bushell, J. H. Level or angle indicators for aircraft. No. 9514. July 3rd.

Corder, B. J. Anti-aircraft device. No. 9687. July 5th.

Cowtan, D. M. Aircraft, etc., construction in metal. No. 9689. July 5th.

Drake, R. R. Manufacture of airscrews. No. 9851. July 7th.

England, E. C. G. Means for supplying fuel, water, or oil in engines of aircraft, motor-cars, motor-boats, etc. No. 9750. July 5th.

Kelly, W. H. Flying machines. No. 9608. July 4th.

Lécuyer, M. Flying machines. No. 9800. July 6th.

Read, H. A. Moutray-. Aircraft. No. 9673. July 4th.

Scanes, A. E. L. Instrument for indicating position of aircraft. No. 9655. July 4th.

Sutcliffe, J. A. Means for preventing penetration of shot through petrol tanks of aircraft, armour-plating, etc. No. 9545. July 3rd.

Tarrant, W. G. Spars, beams, etc., for aircraft. No. 9524. July 3rd.

Tolkowsky, S. Propeller-driven craft. No. 9604. July 3rd.

Warne, S. Toy aeroplane. No. 9621. July 4th.

Complete Specifications Accepted, prints of which are obtainable on and after July 26th, 1917.

107,471. Aug. 24th, 1916. Allan, A. Flying machine.

107,509. Oct. 28th, 1916. Aeronautical Instrument Co., and G. Brewer. Devices for guiding flexible connections for operating valves, rip panels, and the like in aerostats.

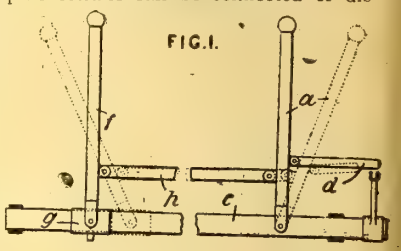
107,510. Oct. 31st, 1916. O'Brien, A. H., and S. Fastenings for aviators' belts and the like.

107,519. Nov. 16th, 1916. Garscadden, T. D., and Boyne, W. K. Aerial screw propellers.

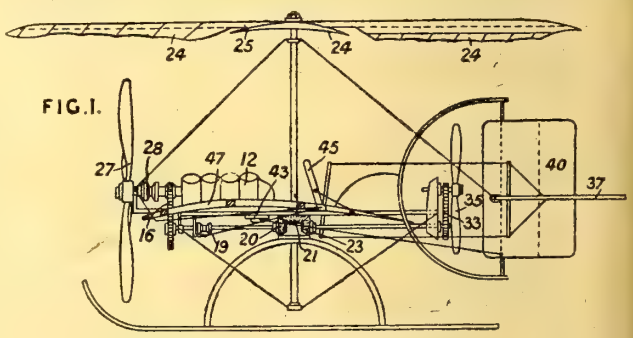
Abridgments of recently published Specifications.

106,116. Aeronautics. Martinsyde, Ltd., Martin, H. P., and Handasyde, G. H., Brooklands Aviation Ground, Byfleet, Surrey. April 20th, 1916, No. 5818.

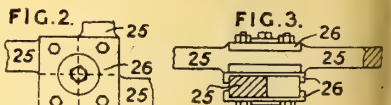
Steering and Balancing.—A dual control for aeroplanes, in which the observer's or pupil's control can be connected or disconnected by the pilot, comprises a main lever *a* pivoted to a shaft or tube *c*, and a secondary lever *f* pivoted to a sleeve *g* capable of sliding and turning on an extension of the shaft or tube *c* but adapted to be locked to it by a plug controlled by a wire. Lateral and longitudinal movement of the lever *a* operates two controls respectively by turning the shaft *c* and by moving a link *d*. A link *h* enables the link *d* to be moved by the lever *f* when the sleeve *g* is secured to the shaft *c*.



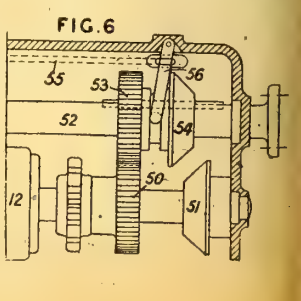
106,092. Aeronautics. Fortescue, A. J., Loftus Street, Arncliffe, near Sydney, Australia. April 20th, 1917, No. 5566. Convention date, March 24th, 1916. Not yet accepted. Abridged as open to inspection under Sect. 91 of the Act.



Aerial Machines without Aerostats; Propelling.—An aerial machine comprises main planes 47 above which rotates a lifting screw propeller 24 driven from the engine 12 through chain gearing 16, clutch or change-speed gear 19 and bevel gearing 20, 21. A tractor propeller 27 may be driven from the engine 12 through a clutch 28, or from an independent engine. A second driving-propeller 35 is arranged in front of the rudder 40 and driven by bevel-gearing 21, 23 and chain gearing 33. In a modification, the tractor propeller 27 may be driven from the engine 12 through friction cones 51, 54, Fig. 6, when starting, and afterwards through toothed gearing 50, 53, the wheel 53 and cone 54 being, for this purpose, slid on the shaft 52 by an arm 56 and rod or wire 55. The blade arms 25 of the lifting-propeller are secured in caps or plates 26 keyed or bolted on the shaft as shown in Figs. 2 and 3.



Steering.—The rudder 40 is arranged immediately behind a propeller 35 in order to increase the steering effect. Elevators 37 are operated by longitudinal movement of a lever 45, which may be moved laterally to adjust the main planes. A foot-lever 43 operates the rudder.



(*Continued from page 162.*)

forces responsible for the attack on a convoy near Bakuba, states :—

A mobile column, accompanied by aeroplanes and armoured cars, inflicted effective chastisement on the enemy, who especially suffered severely from aerial attacks with bombs and machine-guns.

On July 10th two German aviators surrendered themselves to our troops at Samarra, stating that they had abandoned two machines, which were burnt in the desert, and that two other German aviators, who were unable to walk, had been left behind. British armoured cars were at once dispatched to search for the missing men, and if possible to bring them in.

JULY 11th.—The G.O.C. British Forces in Salonika reports :—Our aeroplanes have bombed Drama, Porna, and Angista, and various points on the enemy's line of communications in the Upper Struma Valley.

JULY 12th.—The G.O.C. British Forces in Palestine reports :—Encounters between patrols are of constant occurrence, but there is no change in the general situation.

On July 3rd four small bombs were dropped on Port Said by a hostile aeroplane, and two persons were wounded.

THE CASUALTY LIST.

Reported July 11th.

KILLED.—Carter, Sec. Lt. H. W., R.F.C.

PREVIOUSLY REPORTED PRISONER, NOW REPORTED WOUNDED AND PRISONER IN GERMAN HANDS.—Lloyd, Sec. Lt. E. A., Yeomanry and R.F.C.

KILLED.—R.F.C.—Gray, 1872 Sgt. L. (Aberdeen).
Pocock, 77922 2nd Cl. Air Mech. W. (Isleworth).

DIED.—R.F.C.—Thomas, 41936 1st Cl. Air Mech. J. W. (Boncath).

Reported July 12th.

KILLED.—Horsley, Capt. W. P., M.C., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Mann, Sec. Lt. S. W., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED MISSING, BELIEVED KILLED.—Cotterill, Lt. H. G. K., R.F.A., attd. R.F.C.

WOUNDED.—Elias, Capt. I. G., R.W.F., attd. R.F.C.
Gaunt, Lt. W., M.G.C., attd. R.F.C.
Knight, Capt. A. G., D.S.O., M.C., R.F.C.
Nutkins, Lt. V. W., R. Scots. Fus., attd. R.F.C.

DIED.—R.F.C.—Bonny, 49214 2/A.M. G. C. (Eastcote).

Reported July 13th.

KILLED.—Cleaver, Lt. E. A., R.F.C.
Moore, Sec. Lt. F., R.F.C.
Pascoe, Sec. Lt. F. G. B., R. Irish Fus., attd. R.F.C.
Wyatt, Capt. F., Suff. R., attd. R.F.C.

DIED OF WOUNDS.—Littler, Sec. Lt. T., R.F.C.

DIED.—Simmonds, Sec. Lt. R. G., Worc. R., attd. R.F.C.

WOUNDED.—Wakeman, Sec. Lt. F. T., R. War. R. and R.F.C.
Wynn, Capt. T. S., M.C., Suff. R., attd. R.F.C.

CORRECTION.—Knight, Capt. A. G., R.F.C. (previously reported Missing, now reported Killed), should read :—Knight, Capt. A. G., D.S.O., M.C., R.F.C.

Reported July 14th.

KILLED.—Salmon, Sec. Lt. W. G., R.F.C.
Young, Sec. Lt. J. E. R., R.F.C.

WOUNDED.—Hadrill, Sec. Lt. E. W., R.F.C.
Jones, Lt. M. K., R.F.A., attd. R.F.C.
Lingard, Sec. Lt. W., Manchester and R.F.C.

MISSING.—Adam, Sec. Lt. A. R., Seaforth Highrs. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Stewardson, Lt. E. A., R.W. Surr. R. and R.F.C.

DIED.—R.F.C.—Frampton, 39054 2nd Cl. Air Mech. J. C. (Chorlton-on-Medlock).

AUSTRALIAN FORCE.—KILLED.—Brasel, Sec. Lt. J. S., Australian Flying Corps.

CANADIAN CONTINGENT.—WOUNDED.—Baker, Lt. F. L., W. Ont. R., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Bourinot, Lt. A. S., Quebec R., attd. R.F.C.
Raymond, Lt. A. B., A.S.C., attd. R.F.C.

Reported July 16th.

KILLED.—Erlebach, Sec. Lt. A. W., R.F.C.
Mutch, Lt. G., D.S.O., Gord. High., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Constable, Sec. Lt. A. L., R.F.C.
Morgan, Sec. Lt. A. B., R.F.C.
Nixon, Capt. W. E., K.O.S.B., attd. R.F.C.
Smyth, Sec. Lt. J., R.F.C.

PREVIOUSLY REPORTED WOUNDED, NOW REPORTED DIED OF WOUNDS.—Sykes, Lt. H. K., R.F.C.

WOUNDED.—Morey, Sec. Lt. D. G., R.F.C.

MISSING.—Clarke, Sec. Lt. H. C., D. of Corn. L.I., attd. R.F.C.
Farnes, Sec. Lt. H. C., K.R.R.C., attd. R.F.C.
Smither, Sec. Lt. H., R.F.C.
Watlington, Sec. Lt. H. J., R.F.C.

PREVIOUSLY REPORTED WOUNDED AND PRISONER, NOW REPORTED DIED OF WOUNDS AS A PRISONER IN GERMAN HANDS.—Adeney, Sec. Lt. R. E., R.W. Surr. R., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REFORTED DIED OF WOUNDS AS PRISONERS IN GERMAN HANDS.—Dunford, Sec. Lt. E. T., R.F.C.
Follit, Sec. Lt. R. W., R.F.C.
Langwill, Lt. T., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED WOUNDED AND PRISONER IN GERMAN HANDS.—Morris, Lt. V. C., Army Cyclist Corps, attd. R.F.C.

PREVIOUSLY REPORTED PRISONERS, NOW REPORTED WOUNDED AND PRISONERS IN GERMAN HANDS.—Bevington, Lt. R. J., R.F.A., attd. R.F.C.
Burbury, Lt. A., M.C., Yorks R., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Goodall, Lt. J. H. H., Y. and L.R. and R.F.C.
Smith, Sec. Lt. C. F., L'pool R. and R.F.C.

CANADIAN CONTINGENT.—KILLED.—Rowley, Lt. E. G., Inf., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Metheral, Lt. T. A., Sask. R., attd. R.F.C.

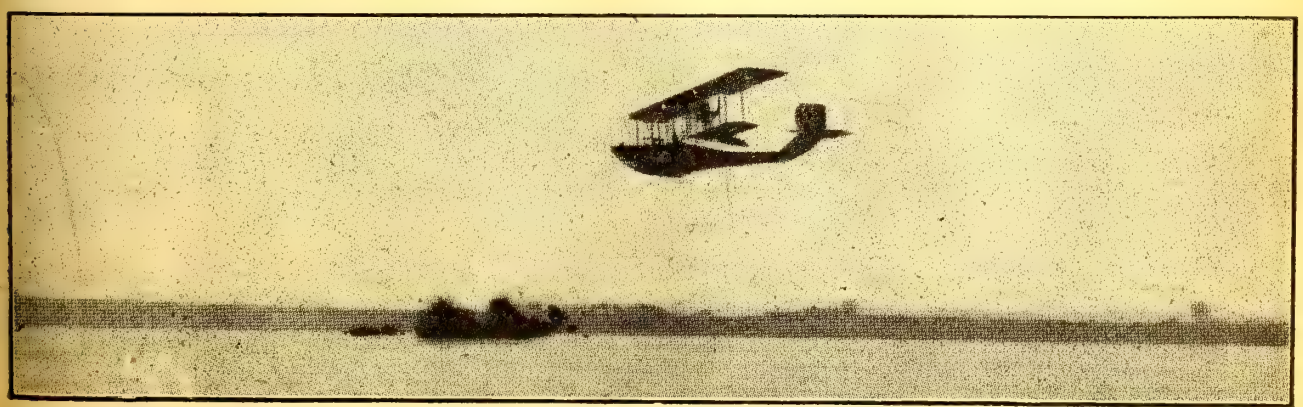
DIED OF WOUNDS.—Trotter, Lt. S. F., Infantry, attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR IN GERMAN HANDS.—Cotton, Lt. H. H., Inf., attd. R.F.C.

Reported July 17th.

KILLED.—Brooks, Sec. Lt. L. W., Hamps R. and R.F.C.
Leckie, Lt. G., R.G.A., attd. R.F.C.
Ryder, Lt. W. H., Yeo. and R.F.C.
Taylor, Sec. Lt. J. Y., E. Lanc R. and R.F.C.
Tardugno, Sec. Lt. R., R. Welsh Fus., attd. R.F.C.

WOUNDED.—Ardley. Sec. Lt. E. L., K.R.R.C., attd. R.F.C.
Copeman, Capt. M. G. B., Leic. R., attd. R.F.C.
Exley, Sec. Lt. W. R., R.F.C.
Goodwin, Sec. Lt. A. S., Sco. Bdrs., attd. R.F.C.
Housden, Sec. Lt. R. J., R.F.C.
Richardson, Sec. Lt. C. R., R.F.C.
Robarts, Capt. G. W., M.C., R.F.A., attd. R.F.C.
Rushbrooke, Sec. Lt. L. A., R.F.C.
Stevens, Sec. Lt. J. M. S. G., R.F.C.



Reproduced from the Italian Official Publication, "La Guerra."

An Italian F. B. A. Flying-Boat Aloft. Note the curious cocked-up tail.

MISSING.—Clark, Sec. Lt. W. H., Mx. R. and R.F.C.
Fitzherbert, Capt. W. W., R. Suss. R., attd. R.F.C.
Gleed, Sec. Lt. J. V. A., R.F.C.
CORRECTIONS.—Smellie, Lt. A., R.F.A., should read:—Smellie, Sec. Lt. A., R.F.C.
DIED.—R.F.C.—Cladish, 77749 2nd Cl. Air Mech. S. L. (Sparkhill).
NEWFOUNDLAND REGT.—KILLED.—Green, Sec. Lt. J. H. S., attd. R.F.C.

PERSONAL NOTICES.

DEATHS.

BOTTOMLEY.—Sec. Lt. Edwin Rhodes Bottomley, R.F.A., attached R.F.C., was the second son of the late Benjamin Bottomley, solicitor, of Bradford, and of Fieldhurst, Ben Rhydding, Yorks, and of Mrs. Bottomley, of Ben Rhydding. He was educated at Shrewsbury School and was for three years a member of the O.T.C. there. On leaving he entered the firm of Lucien Marcan's Successors, of Bradford, but was only there a few months, as on the second day of the war he enlisted in the 4th West Riding Brigade, shortly afterwards receiving a commission in the same brigade. He transferred to the R.F.C. in 1916, obtained his pilot's certificate and his "wings" at the beginning of this year, and was shortly afterwards sent out. He was killed while flying over or close to the German lines on June 2nd, aged 22.

CATHIE and WILLIAMS.—A fatal flying accident occurred on July 11 resulting in the death of Sec. Lt. Cathie and Sec. Lt. Henry W. Knowlson Williams, both of the R.F.C.

While flying in the vicinity of their aerodrome the petrol tank caught fire, and their bodies were burnt almost beyond recognition.

Mr. Knowlson Williams was the only son of the late H. W. Williams and Mrs. W. G. Cozens, of Glastonbury, late of Clifton and Weston-super-Mare. He was 21 years of age.

EVANS.—At an inquest at Croydon on July 11th on the body of Lt. Stewart Nicholson Evans, R.F.C., aged 26, the theory was advanced that while in the clouds something went wrong with the controls of his machine, which crashed to earth. A verdict of "Accidental Death" was returned. He was the brother of Gladys and Gwynn Evans and Phyllis Catchpole.

HAMER.—Lt. Harold Hamer, R.F.C., reported missing on June 6th, now reported killed on that date, in his 26th year, was the fourth son of the late Mrs. A. A. Hamer, of Alistre, St. Annes-on-Sea. He was at Shrewsbury School (1906-10), and enlisted in the Loyal North Lancashire Regiment in August, 1914, being shortly afterwards gazetted. In 1915 he transferred to the R.F.C., and saw active service in the Sudan, being engaged in the battle which resulted in the break up of the forces of the Sultan of Darfur. In the summer of 1916 he was at Salonika, but returned to England in September. He obtained his "wings" early this year, and left for the front in May.

HORSLEY.—Capt. Wilfred Palmer Horsley, M.C., R.F.C. (killed in action), formerly held a captain's commission in a Service battalion of the East Yorkshire Regt. He was afterwards attached to the Trench Mortar Batteries. His award of the Military Cross was in the last New Year's Honours List.

HUNSTONE.—Sec. Lt. G. N. Hunstone, R.F.C., killed while flying in France on June 28th, was the only son of the late Mr. George Hunstone, of Manchester and Mrs. Hunstone, of The Haven, Lingfield Avenue, Kingston-on-Thames. He was only 19 years old, and was educated at Chalmley House, Eastbourne, and Marlborough College. Joining the Artists Rifles in 1915, he received his commission in February of this year, and was gazetted flying officer in May, proceeding to France in June. Mr. Hunstone was killed the day after joining his squadron.

JAKINS.—A verdict of "Accidental Death" was returned on July 11th at an inquest in the Eastern Counties on the body of Sec. Lt. Jakins, aged 20, an assistant flying instructor, whose machine fell and was smashed owing to the engine stopping. It was stated that he was a highly popular and expert flier, and at 15 years of age had written a book on flying.

Walter Vosper Jakins, R.F.C., was the only son of the late Sidney Milroy Jakins, and of Helen Jakins, of 22, Ulster Place, Regent's Park, N.W.1, and late of Woodford.

KNIGHT.—Capt. Arthur Gerald Knight, D.S.O., M.C., R.F.C. (previously reported missing, now reported killed), was gazetted a companion of the Distinguished Service Order on Dec. 11th last "for conspicuous gallantry in action. He led four machines against eighteen hostile machines. Choosing a good moment for attack he drove down five of them and dispersed the remainder. He has shown the utmost dash and judgment as a leader of offensive patrols." He had received the Military Cross a month before, when the "London Gazette" stated that "he has shown great pluck in fights with enemy machines, and has accounted for several. On one occasion, when a hostile machine was interfering with a reconnaissance, he attacked at very close range and brought down the enemy machine in flames."

LECKIE.—Lieut. and Flight Comdr. Graham Leckie, B.Sc., London, R.F.C. (killed in action on July 7th), was the second son of the late Alexander Leckie, of London, and of Mrs. Leckie, Langside Terrace, Glasgow. He was 28 years of age, and formerly held a commission in the R.G.A. Special Reserve. He had his "wings" in February of last year.

LITTLER.—Sec. Lt. Tom Littler, R.F.C. (formerly of Artists Rifles O.T.C.), who was killed in an air fight on July 3rd, was the only child of Mr. and Mrs. John Littler, of Simla, Brixham. He was aged 19.

McARTHUR.—Capt. and Flight Comdr. Lawrence William McArthur, M.C., H.A.C., and R.F.C., previously reported missing, was killed on May 27th, aged 26. He was the only son of Mr. and Mrs. W. McArthur, of Chislehurst, Kent, and was educated at Malvern, Versailles, Tours, and Heidelberg. A member of the H.A.C. before the war, he left for the front with the first contingent in September, 1914, and in June, 1915, was awarded the Military Cross for conspicuous bravery in action at Hooge. Here he was severely wounded, and on recovery entered the R.F.C., and since October, 1916, has been engaged at the front. He was mentioned in dispatches twice, and was gazetted flight commander last January.

MACGREGOR. — Sec. Lieut. Thomas Charles Stuart MacGregor, H.L.I., attd. R.F.C., who was killed on June 8th, aged 20, was the second son of Mr. and Mrs. W. O. MacGregor, of Hazaribagh, India. He was educated at Malvern College, and was in the O.T.C. He received his commission in November, 1914, and joined the H.L.I. in France in September, 1915. He was in the Ypres salient all that winter, and was wounded on May 10th. After three months' leave he joined the R.F.C., and was sent to the front on May 9th. He was doing useful work when both he and his observer were killed in the air by a shell.

O'LONGAN.—Sec. Lieut. P. C. Stacpoole O'Longan, Royal Irish Regt., attd. R.F.C., killed on June 1st, in his 19th year, was the youngest son of Mr. and Mrs. Paul O'Longan, of London, and grandson of the late Joseph O'Longan, M.R.I.A., well known in literary circles in Dublin. He was educated at King's College, and was gazetted from Sandhurst to the Royal Irish Regt., and attached R.F.C. He obtained his "wings" on March 19th, and went to the front on April 26th as a scout pilot. He was an expert horseman, and a good all-round athlete, and a few weeks before his death published a little book of poems entitled "Last Post and other Poems," the majority of which were written in his 16th year.

His commanding officer writes:—"Your son was very brave, and although unfortunately we only had him for a comparatively short time, we all liked him immensely. Everyone took to him at once, and he was very popular. He was looked upon as being one of the best of partners on a patrol, and a comfort to the rest. . . . He was doing most awfully well, and had already done real good work, and I am sure he would have done great things. I send you an extract from a German document. . . . It shows, at any rate, that your son was game, and fighting to the last minute, as everyone who knew him expected him to be." According to the German message Mr. O'Longan was brought down by enemy airmen, but when falling, and only 200 metres from the ground, he turned his machine-gun on their fighting aeroplanes, but was shot down by rifle-fire from the ground.

PLATT.—Capt. Lionel Sydney Platt, Lancers and R.F.C., reported missing April 13th, now known to be killed, was the only son of Sydney Platt, St. Bruno, Sunningdale. He was 32 years of age.

RYDER.—Lt. William Harold Ryder, Yeomanry, attached R.F.C., who was killed in action on July 6th, was the third son of Mr. C. F. Ryder, of Scargroft, near Leeds, and Thurlow, Suffolk. He was aged 20.

He had his commission in the Yeomanry in March, 1915, and in February of this year he was gazetted flying officer R.F.C.

SALMON.—An inquest was held at Dartford on July 10th on the body of Sec. Lt. Wilfrid Graham Salmon, R.F.C., who met his death on July 7th in the air raid.

Lt. Douglas Gordon Nairn, Adjutant R.F.C., said that Mr. Salmon, who was a qualified pilot, went up on July 7th at 9.40. Witness saw him coming down. He appeared to lose control of the machine, which was in perfect order when he ascended. On examination of the machine after the fall it was found that 55 rounds of ammunition were gone from the magazine.

Hubert Williams, of Erith, a discharged soldier, said he saw the machine fall, and assisted to get the pilot out. The machine was smashed, and there was a wound in the officer's head which looked like a wound from a machine-gun bullet.

Major Glen Knight, R.A.M.C., who made a post-mortem examination, said that Mr. Salmon had two lacerated wounds in the forehead, and the skull was fractured from ear to ear. Prob-

ably that on the head was a gunshot wound and the fracture was caused by the fall.

Capt. Herbert Sison, R.F.C., asked the last witness if it was possible for a man after being hit by a bullet to lose and regain consciousness, and then lose it again. The reply was affirmative.

Capt. Sison said he saw the machine about 2,000 ft. up coming down spinning sideways. Thinking it was someone coming down safely he momentarily looked away, and a few seconds later it was down. The machine was found to have the petrol tank punctured from side to side by a bullet and all the petrol gone. A wire control was also hit by a bullet. He thought if Mr. Salmon could have regained consciousness he could have landed safely. The Coroner said there was no doubt this was another case of a life sacrificed for the country.

A verdict was returned to the effect that death resulted from wounds received in combat with German aeroplanes.

[It is somewhat curious that so much publicity has been given to this casualty, as compared with the concealment of the deaths of the gallant officers who were killed during previous aircraft attacks.—Ed.]

TROTTER.—Lt. Stuart Fowden Trotter, Canadian Infantry, attached R.F.C., killed on July 6th, was the second son of Mr. and Mrs. J. Glass Trotter, of 218, Stanstead Road, Forest Hill, and dearly-loved husband of Dorothy Beryl Trotter, aged 31.

VAN GOETHEM AND TATHAM.—A verdict of "Accidental Death" was returned at an inquest at Brockenhurst, Hants, on July 16th on the bodies of Captain Henry Edward Van Goethem, R.F.C., of Parkstone, Dorset, and Sec. Lt. I. Mordaunt Tatham, of Natal, South Africa. The evidence showed that Capt. Goethem was giving the junior officer his first instruction in flying a particular type of machine, when it nose-dived to earth and burst into flames. Both officers were killed.

Captain Van Goethem, R.F.C., was twenty-three years of age, and the son of Mr. and Mrs. E. Van Goethem, of Tregarthen, Parkstone, Dorset. He was appointed flight commander, R.F.C., in Jan., 1916, with the temporary rank of captain.

YOUNG.—In the course of the raid on July 7th on this country by enemy aeroplanes Sec. Lieut. John E. R. Young, R.F.C., and his observer were shot down and killed after a plucky fight against the raiders. Mr. W. S. Young, of 76, Mitcham Lane, Streatham, has received from his son's Squadron Commander the following letter:—

"It is with the deepest regret and sympathy that I have to write and inform you of your son's death, which took place on Saturday during the enemy aircraft attack on this country. Your son, as you know, had only been in my squadron for a short time, but quite long enough for me to realise what a very efficient and gallant officer he was and what a tremendous loss he is to me. He had absolutely the heart of a lion and was a very good pilot. Your son has been up on every raid of late, and has always managed to get in contact with the enemy machines. The last raid, which unfortunately resulted in his death, shows what a very gallant officer we have lost. Almost single-handed, he flew straight into the middle of the twenty-two machines, and both himself and his observer at once opened fire. All the enemy machines opened fire also, so he was horribly outnumbered. The volume of fire to which he was subjected was too awful for words. (To give you a rough idea—there were twenty-two machines; each machine had four guns; each gun was firing about 400 rounds per minute.) Your son never hesitated in the slightest. He flew straight on until, as I should imagine, he must have been riddled with bullets. The machine then put its nose right up in the air and fell over and went spinning down into the sea from 14,000 ft. I unfortunately had to witness the whole ghastly affair. The machine sank so quickly that it was, I regret, impossible to save your son's body; he was so badly entangled in the wires, etc. H.M.S. —— rushed to the spot as soon as possible, but only arrived in time to pick up your son's observer, who, I regret to state, is also dead. He was wounded six times and had a double fracture in the skull. I cannot speak too highly of the magnificent behaviour of your son. All that I can say is that he was a most gallant officer, and that I am proud to think that he was in my command. I hope that you and your family will accept my sincerest sympathy and also the sympathy of all his brother officers in your great loss."

Engagements.

GOSSAGE—O'BRIEN.—An engagement is announced between Major Ernest Leslie Gossage, M.C., R.F.A. and R.F.C., elder son of Colonel E. F. Gossage, V.D., late Brigadier-General, and Mrs. Gossage, of Dorin Court, Upton Heath, Chester, and Eileen Gladys, only daughter of Brigadier-General E. D. J. O'Brien, C.B., late Hussars, and Mrs. O'Brien, The Rectory, Buxted, Sussex, and granddaughter of the late Colonel Sir Terence O'Brien, K.C.M.G., some time Governor of Newfoundland.

GOULD—SPERLING.—An engagement is announced between Capt. L. N. Gould, M.C., R.G.A. and R.F.C., eldest son of Mr. Lionel Gould, of The Gable House, Bilton, Rugby, and Barbara, only daughter of Mr. C. F. D. Sperling, of Beresford House, Leamington, and Dynes Hall, Halstead, Essex.

MOLESWORTH—STEELE.—The engagement is announced between Capt. W. E. Molesworth, Royal Munster Fusiliers, attd. R.F.C., son of Col. W. Molesworth, C.I.E., I.M.S., and Mrs. Molesworth, of Cruxfield, Duns, Berwick, and Dorothy, second daughter of Col. St. G. L. Steele, C.B., I.A., and Mrs. Steele, Kelston, Hythe, Kent.

RAWLINS—BAKER.—A marriage has been arranged, and will shortly take place, between Arthur Charles Champion Rawlins, Lieut., R.F.C., third son of Mr. and Mrs. Charles Rawlins, of Dunedin, New Zealand, and Sydenham Hill, and Phyllis Yvone Marion, elder daughter of Mr. Sidney H. Baker, of 6, Marine Square, Brighton.

THOMPSON—MILLS.—The marriage arranged between Lieut. Stewart W. Thompson, R.F.C., and Madge, daughter of Mr. and Mrs. H. Slowburn, Richmond House, Wimbledon Common, and widow of Gordon Mills, Coldstream Guards, will take place at Holy Trinity Church, Putney Hill, on Wednesday, July 18th, at a quarter past two o'clock. All friends will be welcome at the church.

Marriages.

FLEMING—FAIRLIE.—On July 14th, at St. Augustine's, Queen's Gate, Capt. Wilfrid Allan Fleming, Devonshire Regt. and R.F.C., only son of A. S. Fleming, Indian Civil Service (retired), Millholme, Chagford, Devon, was married to Dorothy Norma Paterson Fairlie, younger daughter of Lt.-Col. W. F. Fairlie, Hillside, Gorey, Jersey, by licence.

KINGSFORD—PEPPERDINE.—On July 10th, at Marylebone, Sec. Lt. Alfred Reginald Kingsford, New Zealand Expeditionary Force and R.F.C., was married to (Nurse) Charlotte Pepperdine, of Devonshire Street, Portland Place, W., by special licence.

POTTS—THORNDIKE.—On the 14th inst., at St. Peter's, Lee, S.E., William Janson Potts, Lt., R.F.A. and R.F.C., only surviving son of the late William Potts, Esq., of Sanderstead Hill, was married to Gladys Isabelle, only child of the late Major F. H. Thorndike, 2nd R. Sussex R., by the Lord Bishop of Manchester, and the Rev. Basil P. W. French, uncles of the bride, assisted by the Rev. Canon Ottley, Vicar of the Parish.

SHILSTONE—SEMPLE.—On July 10th, 1917, at Christ Church, Richmond, S.W., Lt. Arthur Bernard Shilstone, R.F.C., the second son of W. A. Shilstone, I.S.O., Assistant Secretary, P.W.D., India, was married to Ruth, third daughter of James Charles Semple, F.R.G.S., F.R.C.Inst., M.R.I.A., 24, Beaumont Avenue, Richmond, and Kingstown, Ireland, granddaughter of John Semple, C.E., formerly High Sheriff of Dublin, and grandniece of Sir Thomas Whelan, formerly Lord Mayor of Dublin, by special license, by the Rev. W. Blerber, M.A., Vicar.

TAYLOR—DEWBERRY.—On July 9th, at Great St. Mary's, Cambridge, Capt. Malcolm Lincoln Taylor, R.F.C., son of Leo Taylor, Esq., C.C., of Walthamstow and Southend-on-Sea, was married to Ada Gwendoline, daughter of H. W. Dewberry, Esq., of Cambridge, by the Rev. C. L. Hulbert, Vicar.

Births.

HOLLIDAY.—On July 13th, at Hastings, the wife of Capt. F. P. Holliday, D.S.O., M.C., R.F.C., a daughter.

LEWIN.—On July 12th, at 77, South Side, Clapham Common, Lordon, S.W.4, the wife of Sec. Lt. H. S. Lewin, R.F.C., of a daughter.

R.F.C. Officers Missing.—Will those communicating with R.F.C. prisoners in hospital or camp in Germany kindly inquire as to fate of Lt. T. Thomson and, or, Sec. Lt. A. M. Turnbull, missing on April 25th, and report to M. H. Turnbull, 9, Chlorine Gardens, Belfast?

* * *

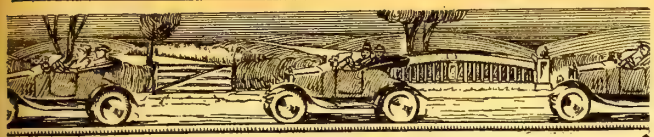
Capt. James Stuart, R.F.C., has been missing since April 13th. His mother, Mrs. Stuart, of Somerset, Coleraine, Ireland, would be glad of news.

* * *

Among those to whom the committee of the Royal Humane Society has awarded medals are the following:—

Lt. C. M. Morrell, Royal Munster Fusiliers and R.F.C., an interned officer, for his gallantry in saving a Dutchman at Scheveningen, Holland.

Thomas McDonald, R.F.C., for his attempt to save Sergeant Brooks, whose aeroplane fell into the sea at Aboukir an Mar. 21st.



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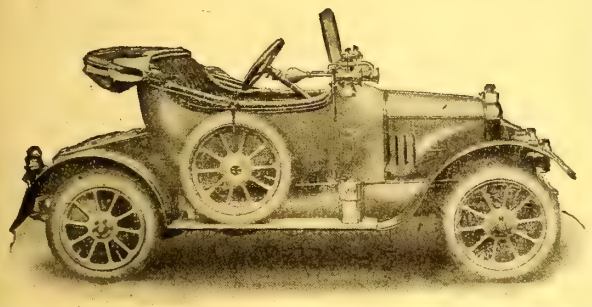

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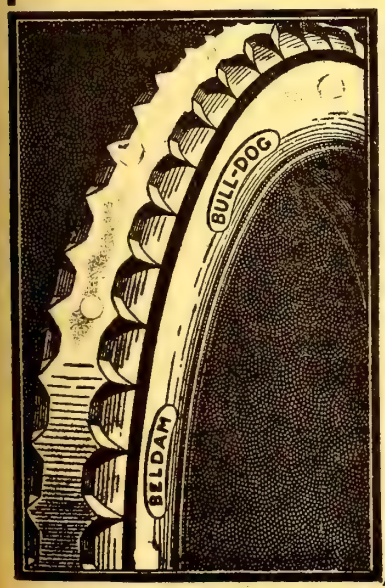

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Godbolds.

The forced landing of a balloon in Holborn on July 11th caused a deal of excitement. Coming from the westward, the balloon was observed to be in difficulties over the City for some time. There was no wind, and it drifted slowly. Soon it was noticed that the envelope was flabby, as if the gas were leaking out. A large crowd followed its course as it drifted along over the housetops down Holborn towards Chancery Lane. Slowly the balloon dropped until the basket hit the chimney pots of Bank Chambers. The guide rope was then in the street and a number of men caught hold of it and hung on.

Traffic along Holborn was entirely held up, and obeying the directions of the four R.F.C. officers who formed the crew, the crowd swung the balloon clear from the roofs, and, at the expense of a few overhead wires, pulled the basket safely to the ground in the centre of the road opposite Chancery Lane. Eventually the envelope, together with the basket, was dragged into the courtyard of Gray's Inn pending removal.

* * *

An inquest was held at Lincoln County Hospital on July 12th on the body of a ploughman who was knocked down and fatally injured by an aviator who was making a landing. The aviator at the time was flying at a speed of 65 miles an hour.

The aviator stated in evidence that he saw nothing until the accident occurred. The employer of the man who was killed said there had been some narrow escapes, and suggested that red flags should be placed where the men were working.

The jury found that the affair was purely accidental.

FRANCE.

Official Communiqués.

July 10th.—Army of the Orient.—British aviators bombarded Petric (in Bulgaria, Strumnitza Valley).

July 10th.—Army of the Orient.—An enemy aeroplane was forced to land near Livadi, south of Liumnitza.

July 12th.—Army of the Orient.—British aviators bombarded the railway station at Angista, 17 miles east of Seres (Struma valley).

The German captain and pilot who were found in the enemy machine captured yesterday (July 10th) have been made prisoners.

July 13th.—During the period from the 8th to the 10th of July ten German aeroplanes were brought down on our front, including eight in aerial fights and two by the fire of our machine-guns. Besides, eight enemy machines fell in their own lines in a badly damaged condition.

July 14th.—During the night German aeroplanes dropped bombs on the entire region north of Nancy. Two women and a child was killed.

July 16th.—Army of the Orient.—An enemy aeroplane brought down by a British machine fell in flames near Angista (Struma Valley).

* * *

The Official Journal published on July 11th contained the text of an Army Order conferring the Croix de Guerre and Palm upon the following members of the Royal Flying Corps in France:—Elder, Davies, Draper, Pearks, Dallison, Newberry, Rees, Potter, and Glen. No ranks are given.

* * *

Lord Donoughmore, British Red Cross Commissioner in France, has reported to Red Cross headquarters, 83, Pall Mall, that Chef de Demi-Section Frederick Hindle and Voluntary Driver Thomas Percival Gillibranc, of Section Sanitaire Anglaise No. 16—one of the British Red Cross units working with the French armies—have been cited in an Order of the 33rd Division for going to the rescue of a French aviator who had fallen during an air fight and was lying wounded with his machine, which the enemy were seeking to destroy by a very heavy fire.

They disengaged the aviator from his machine and bore him to a place of safety.

* * *

At the Fête Nationale held in Paris on July 14th, 150 aeroplanes flew over the parades and subsequent procession. The Aviation Militaire was represented by Capt. Guynemer, who carried the flag of his escadrille, which apparently was singled out as the most successful squadron in the French Army.

* * *

It was reported from Paris on July 12th that the French Seaplane Patrol Service at various centres carried out during the month of May and in all weathers 2,627 flights, averaging 1¾ hours per flight. On 14 occasions French seaplanes attacked German submarines, whilst in 3 cases they were successful in locating enemy mine fields. An enemy cruiser was also attacked Eight night bombardments on enemy bases in Belgium and the Adriatic were also successfully carried out, whilst as the result of 3 air battles 2 enemy machines were destroyed. Assistance was also rendered to a vessel in distress.

On July 1st a large vessel, which was torpedoed by a German submarine in the Atlantic and was abandoned by the crew as it seemed on the point of sinking, was successfully towed to safety by the small escorting vessels. On July 6th a steamer, which stranded near the island of Yeu, in the Bay of Biscay, in order to escape from a German submarine, was successfully refloated and brought into port. On the same day and in the same vicinity another steamer, which was also regarded as lost, was successfully refloated and brought into port.

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A seaplane belonging to the Brest station, while reconnoitring on July 14th, sighted a sailing ship which was sinking and near her a big submerged submarine. The seaplane dropped bombs on the latter, which was not seen again.

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The Paris "Journal" announces that the French champion cyclist, Octave Lapize, has been killed in the course of an aerial battle which four French aeroplanes were carrying on with nineteen German machines in the environs of Nomeny.

GERMANY.

Official Communiqués.

July 10th.—The results of the engagements against the enemy aircraft forces in the month of June were good.

Our enemies have lost 220 aeroplanes and 33 captive balloons through the effect of our weapons. Our anti-aircraft guns shot down 60 enemy aviators, the remainder having been brought down in aerial fighting.

Our losses amount to 68 aeroplanes and three captive balloons.

July 11th.—During the past few days our air squadrons successfully and repeatedly showered bombs on the North Courland coast, on the batteries, barracks, and harbour works near Reval and Arensburg, and on the island of Oesel (north of the Gulf of Riga). Hits and fires lasting a long time were observed. In spite of the violent shooting of hostile batteries our aeroplanes returned safely from all their undertakings.

July 13th.—In the course of numerous aerial engagements the enemy lost 17 aeroplanes; two others were also brought down by anti-aircraft fire.

First Lt. Ritter von Tutscheck, who on July 12th (?) brought down two enemy aviators, yesterday won his 16th aerial victory by shooting down a captive balloon.

July 14th.—Twenty-one enemy aviators and one captive balloon were brought down yesterday (Friday) in aerial engagements and by means of defensive fire.

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Reports from Lake Constance agree that no more airships are now being constructed at the Zeppelin factories at Friedrichshafen. The thousands of workmen employed there, according to an Exchange telegram, are working on aeroplanes.

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The Wolff Bureau has issued the following amusing narrative:

Information has reached us to the effect that the English have formed a special squadron composed of volunteer aviators, whose duty it is to shoot down their most dangerous adversary, Baron von Richthofen. The Victoria Cross, a brand-new aeroplane, to remain his own property, immediate promotion, and a prize of £5,000 in cash are offered as a bait to the man who succeeds in the attempt to kill the best German air fighter.

Apart from this a further reward of £1,000 is promised to the flying division of which a member contrives to capture Richthofen, either alive or dead. Moreover a sum of £500 is promised to the leader of the brave band. The War Office order to this effect has been read out to all English aviators.

[What an astonishing similarity there is between the English and German press people, whether on paper or in news agencies! This yarn is quite in the best English manner and recalls the story of the reward offered by the Kaiser for the head of Commander Samson.—Ed.]

RUSSIA.

Official Communiqué.

July 11th.—Baltic Sea.—On July 9th, squadrons of enemy seaplanes performed three flights over Arensburg and the region of Tserelia, dropping about 30 bombs on the roadsteads, the batteries, and other structures, without result, and causing no loss or damage.

On July 8th an enemy Zeppelin made a flight over the south-western extremity of the Aland Archipelago.

ITALY.

Official Communiqués.

July 11th.—This morning enemy aeroplanes carried out a brutal bombing raid on Cividale (Friuli) without being justified in so doing by any military reason. The only result was a few victims in the civil population and slight damage to some buildings.

July 14th.—Aerial activity was considerable during the whole day; all our machines returned safely. An enemy machine was brought down in an air fight, and fell between Miramare and Trieste.

July 15th.—There was considerable aerial activity in Carnia and on the first line of the Julian front. An enemy machine brought down in aerial combat fell in flames east of Kostanjevica.

July 16th. At dawn this morning one of our big bombarding air squadrons, accompanied by escorting aeroplanes, carried out a raid on the enemy's lines of communication east of Selo (Carso, south of Versic), where numerous troops were discovered and effectively bombed.

Our machines, which flew very low in order to drop the bombs, have all returned safely, notwithstanding the enemy's anti-aircraft fire and hostile machines, one of which was brought down and the others driven back.

This morning enemy seaplanes dropped bombs between the Isonzo and the Carso. There were a few victims, and slight damage was caused.

BULGARIA.

Official Communiqué.

July 10th.—On the right bank of the Vardar an enemy aeroplane was brought down after an aerial combat

TURKEY.

Official Communiqué.

July 6th.—Sinai Front.—On July 4th our aviators successfully bombed the railway station of Port Said.

SERBIA.

Official Communiqué.

July 11th.—Our air squadrons dropped 42 bombs north of Kozuh and 10 in the Gradesnica valley (both east of the Tcherna). In the course of aerial fighting a German aeroplane was brought down and fell in our lines.

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In a note on the variegated uses of aircraft, the "Express" says that during the Serbian retreat aeroplanes were used as ambulances for the first time. Thirteen gravely wounded men needed to be moved at once; several would lose their lives unless operated upon without delay. The journey over mountainous roads to a coast hospital was beyond their strength, so it was decided to carry them to the Italian port of Valona by aeroplane. One of the worst cases travelled over 200 miles thus, the pilot making one landing—at Prizrend—to make sure that his passenger was still alive.

[The story takes some believing, for a badly wounded man would scarcely be at his most comfortable in an ordinary aeroplane.—Ed.]

SWEDEN.

It was reported from Stockholm that on July 9th Swedish warships were dispatched in pursuit of German airships, which, according to reports received there, had been observed off the Baltic coast and were of quite a new type. They are said to carry five gondolas, and the framework is made of wood instead of aluminium. Some of these vessels were accompanying a fleet of 15 merchantmen.

U.S.A.

The House of Representatives' Military Committee by a unanimous vote on July 12th reported favourably on the Administration's Aviation Bill providing for the construction of a great aeroplane fleet. At the request of the War Department no details of the proposed construction were outlined in the measure. Mr Baker, Secretary for War, and several aviators were present, and urged the immediate necessity for augmenting the air forces of the Allied nations.

On July 15th, after a four hours' debate, but without a division, the House of Representatives voted a sum of £128,000,000, to be devoted to aviation.. It is to be hoped that now so much money has been allocated for this work, that the money will not be frittered away upon mediocre aeroplanes of types put forward by incompetent enthusiasts, but that sufficient notice will be taken of the experience so dearly bought by the Allies in Europe.

AUSTRALIA.

The Hon. W. A. Holman, Premier of New South Wales, who is at present on a visit to Europe, and who recently was at the Western front, during which visit Major-General Holmes was killed by a shell within a few feet of the Premier, is the founder of the first State Aviation School of Australia in New South Wales.

The School is situated at Richmond, near Sydney, and is designed to train men, who are qualified for the Army, in every branch of the art of aviation, prior to their military training, thus enabling the latter to be of as brief duration as possible.

Mr. Holman was greatly interested in the work of the R.F.C. while in France, and is keenly following the work of the air services in this country.

Mr. Holman has received notification that 20 battleplanes have been presented by Sir Samuel McCaughey, one of the leading pasturalists of the State. This makes a total to date of 38 battleplanes presented by New South Wales to the Imperial Government.

THE PREMIER ON AIR DEFENCE.

A deputation of members of Parliament representing Constituencies in London, introduced by Mr. Dickinson, waited upon the Prime Minister at No. 10, Downing Street on July 13th, for the purpose of placing before him their views as to the need for the improvement of the defence of London against air raids. The proceedings were private, and the report is supplied officially.

The following are extracts from Mr. George's speech to the deputation. The whole argument shows Mr. George at his very worst, as a mere politician trying to dope a lot of feeble agitators into a state of quietude. Mr. George said:—

Now, I do not want you to go away with any idea that we do not realise the importance of defending London. (Hear, hear.)

I realise that there is a special case for defending London, even in comparison with other towns, for the simple reason that it gives special satisfaction, undoubtedly, to the Germans to be able to bomb the capital of their most hated enemy. And we are proceeding upon that assumption—we are acting upon it.

I still say, on behalf of the Government, that we must put the safety of the soldiers at the front first. (Hear, hear.) If anyone in this country says "Ourselves first and our soldiers afterwards," well, then, they had better find another Government.

[Quite so, but are the soldiers at the front for the safety of their folk at home, or for their own safety?—Ed.]

I am the last man in the world to think lightly of the deaths of these poor people on Saturday or on any other day; but if you took the whole of the casualties that have occurred from the beginning of the war from hostile aircraft during the whole of these three years they are not as great as the casualties suffered by our soldiers in a small battle in France.

[If this line of argument is logical, why not bring the Army back from France, mix it up with the civilian population, let the enemy invade England unhindered, and so let the military and civilian casualties average up in proper proportion?—Ed.]

We had absolutely no hesitation in supporting the claim of our military advisers that the soldiers at the front must have the first demand upon our resources.

[Which, of course, is quite another line of argument, and quite a sound one.—Ed.]

Now you were talking about the falsehoods which have been disseminated. . . . We are told that we had squadrons here, and that those squadrons were sent to France (I think it was said against the advice of the military) at the instance of the civilians. They were sent there at the urgent request of Sir Douglas Haig.

Now, I come to the next point—about these stories, which I now hear for the first time, that these squadrons were sent for other than military purposes. They are pure inventions.

[And, anyhow, they were not the type really required to tackle Gotha formations.—Ed.]

Then there was the question, or the rumour, of a certain number of aeroplanes at Hendon which had been tampered with and were unable to go up. There is no truth whatever in it. None of those things are anything but pure inventions.

Another statement has been made to the effect of London being bare of fighting aircraft. Well, now, whose statement is that? The actual fact is that a greater number of first-class fighting aircraft went up into the air on our side than the number of the hostile aeroplanes which came over. But you cannot always, in a fight, guarantee that when you attack hostile aeroplanes you will bring them down, because, if you did, what about our aviators who are constantly crossing the German lines and coming back alive? They are attacked often by two, three, and four to one, and yet they come back, the majority of them. You may riddle a machine and yet never hit a vital spot. But, after all, out of the 22 machines that came over four were brought down.

[They were not. The official communiqué says that *one* was brought down. The R.N.A.S. stated definitely that they never saw the invaders, and that the machines brought down by them were defensive patrols which did not leave Flanders.—Ed.]

That is a pretty high percentage. It is a much higher percentage than was brought down of the French machines which crossed over the German lines just recently. In that case there were only two out of 84 brought down by the Germans, while we brought down four out of 22. Do let us be fair to these very gallant aviators, who did their best. (Hear, hear.)

[Apart from the fact that Mr. George's figures are wrong, as indicated above—the argument is fallacious. The French machines were operating in the dark, and the Germans were in full daylight.—Ed.]

The Cabinet have decided that General Smuts and I should undertake a general investigation into the matter, and we are doing it. Every reasonable precaution has been taken, and whatever practicable steps can be taken along the lines of improving the defence of London are being taken.

[If General Smuts really gives his attention to the subject good results may follow, but there should be no need for either General Smuts or Mr. George to have anything to say in the matter. The Air Board alone ought to be able to do it easily.—Ed.]

COMMON SENSE IN THE LORDS.

The following debate—as recorded by the "Times"—took place in the House of Lords on Tuesday, July 10th. As is customary, more sense and less nonsense was talked than is customary in the Lower House.

Lord Tenterden asked the Government who was responsible for the want of facilities given for the construction of aeroplanes in this country, seeing that our aerial defences at home had been for some time totally inadequate; that a Parliamentary Committee be at once formed to meet representatives of aeroplane factories with a view to taking immediate steps to increase the output of aeroplanes; and that a large standing fleet of aeroplanes be kept for home defence and for use for reprisals on German towns, the latter to be undertaken in force and by thoroughly up-to-date machines. The question, he said, had a more or less direct bearing on the recent raid on London. It was a remarkable sight to see a large fleet of enemy aeroplanes complacently flying home after having murdered defenceless women and children. It was an extraordinary thing that the raiders should not be attacked on the coast and driven away before they got here. They never got within forty miles of Paris, because it was the custom there to send up large numbers of aeroplanes at intervals every day to scout around. Also they had better aeroplane guns and their shooting was better. What was the reason we were not able to put up a better fight? It was quite evident in November when one aeroplane came over and dropped a bomb on a milk shop and killed a woman and child that if one could come it was easier for a hundred to come, because they were in battle formation and protected one another. That was eight months ago and the Government should have taken the matter in hand then and constructed a sufficient number of aeroplanes. The arguments put forward by the Government had not convinced him. Compared with our enemies we were overflowing with money and out of the eight millions a day provided for the war something ought to be spared for defending the country from these attacks. America had set aside over a million for the early construction of aeroplanes. What had we set aside? That was what he wanted to know and what "the man-in-the-street" wanted to know. He happened to be chairman of a company engaged in manufacturing parts of aeroplanes and he had asked the Ministry of Munitions and the Air Department of the War Office to be allowed to have more plant and machinery to cope with national work. He had to go down on his knees for it. The Government had got to do something. They had been long enough over it. He wanted to know when they were going to start.

The Marquess of Crewe said he took special interest in the subject for two reasons. In the first place the London County Council, of which he was chairman, had the control and management of the Fire Brigade; and, in the second place, the control and management of the schools of London, upon which terrible outrages had been perpetrated during the raids. Every one in London, even those who themselves had suffered from these attacks, knew that preference must be given to the demands of the Army at the front in this matter of the provision of aircraft. But the impression must not be created—and he did not, of course, attribute to the Government any such intention—that the sufferings and misfortunes of people here were of somewhat minor importance in comparison with the casualties which took place at the front. He thought it possible that the degree of courage and self-control which had been displayed, noticeably, he thought, by some of the very poor, might have slightly misled people into supposing that the situation was taken with greater indifference than it was. It would be a mistake to suppose that that calmness and courage of demeanour did not cover a great deal of very real resentment. (Hear, hear.) He had no doubt the holding of a private sitting in another place on Monday was necessary and desirable; but he believed some people were inclined to think that the reason for this procedure was not so much to prevent the disclosure of facts that ought not to be made public, as the keeping secret of something—he knew it was not the case—which the Government for their own reasons did not desire to make public. These considerations had to be borne in mind. Speaking as representing the largest local authority in London, he pressed upon the Government the importance and necessity of reassuring so far as they could the public, because he was quite certain that some such restoration of confidence was urgently needed.

Aeroplane Production.

The Earl of Derby was in entire agreement with the Marquess of Crewe as to the amount of courage shown by the people of London during air raids. He would look upon it as wrong to allow that courage to be used as an excuse for failing to provide as far as was possible for the defence of London. It was quite true that the claims of France must come first, but people were apt to forget the other theatres of war—Mesopotamia, Egypt, and Salonika—also required more aeroplanes. The relative value to be given to the demands from these different theatres and to the demands for the defence of this country was a problem that gave rise to the most anxious thought. Every consideration would be given to the defence of this country, bearing in mind the demands from the various theatres of war. The best way of giving protection was by doing everything they could to increase the output of aeroplanes.

"A Stupendous Increase."

It would not be right for him to give figures, but the increase was stupendous and was going on week by week, to such an extent as to tax to the utmost our training of pilots and our provision of aerodromes. Everything that possibly could be done was being done to increase the output of aeroplanes, and on this increase must rest our ultimate safety both here and at the various fronts. He hoped what he had said would give some sense of security to London, but it would be idle for him to pretend that raids on this country could be entirely frustrated and eliminated from the enemy's operations. He hoped that what was being done would make raids so costly to the Germans that it would not be worth their while to continue this barbarous form of warfare. Referring to the questions put by Lord Tenterden, he said that if debate on the air service was necessary, this was not the form in which it should have originated. The noble lord's remarks simply resolved themselves into a diatribe against the Air Board because his particular firm had not been given all the tools that they asked for.

There was not a word of truth in the assertion that the output of aeroplanes was being hampered by unwillingness to spend money. Everything in the way of aeroplanes that money could buy was being bought and would be bought. The statement that there was plenty of skilled labour was far removed from the truth. We were very deficient in skilled labour. The noble lord had complained that various tools were not issued to his firm, and asked why they were kept back. They were not kept back. Machinery was one of the greatest demands of the Air Board at present; they could only get a limited supply. What they did was to allot it to those firms they thought would make the best use of it. He did not consider that the proposal that a Parliamentary Committee should be formed to meet representatives of aeroplane factories could be looked upon as a serious proposal. As to the suggestion that a large standing fleet of aeroplanes should be kept for home defence and for reprisals, the noble lord did not appear to have grasped the fact that the two kinds of aeroplanes were entirely different and could not be used for the two purposes. He only hoped the Government would be able to show in the future that what could be done was being done, not only for our troops in the field, but for our defence at home. The surest way of securing safety both in the field and at home was by increasing the output of aeroplanes. The Air Board was getting into such a good way that we could look forward in the immediate future to a very large increase of the best kind of aeroplanes. (Cheers.)

Lord Tenterden said that as some aspersions had been cast upon him, he wished to reply. There were cries of "No!" whereupon he said he could prove his statements and challenged contradiction.

Lord Tenterden is wrong in ascribing the safety of Paris to the alleged Paris patrol, which has long been a joke in the city itself. The safety of the capital is due to the fact that raiders on Paris would never get back past the aerodromes at the front. However, he touched the right spot in his reference to the difficulty in getting permits to make aeroplanes under proper conditions.

Lord Crewe's remarks on that futile Secret Session are excellent. Everyone believes that the Government's sole object was merely to shield its own weakness, and many believe it was to hide the inefficiency of Mr. Bonar Law's favourites at the Air Board, whom he is so anxious to protect from dismissal.

Lord Derby did his best in defence, but, of course, he had to accept as gospel whatever was handed out to him by his department. The output of aeroplanes has increased remarkably, but the question is whether it could not be increased very much more—as it certainly could be—and whether the aeroplanes and engines are of the type most desirable. Quantity without quality is useless.

AIRCRAFT IN THE COMMONS.

[The following questions dated June 6th, 12th, and 15th had to be held over owing to lack of space, and are now published because they affect principles of administration.—Ed.]

KENLEY COMMON. ACCEPTANCE PARK (ROYAL FLYING CORPS).

On June 6th **Sir F. Banbury** (by Private Notice) asked the Under Secretary of State for War whether he is aware that Kenley Common, one of the open spaces which the Corporation of the City of London is under a statutory obligation to maintain for the use of the public for ever, and occupying an area of about 81 acres, has been taken possession of by the military, who are cutting down the trees, some of which are 80 years old; whether he is aware that there is a larger common in the neighbourhood, Farthingdown, occupying an area of 121 acres, which is more

suitable, and whether he will stop the destruction of the trees until the other site has been considered?

Mr. Macpherson: It has been decided to take over Kenley Common as an acceptance park for the Royal Flying Corps, and as an aerodrome for the purpose of assisting against hostile daylight raids. The common has been examined by many skilled pilots, who all came to the conclusion that there was no place near at hand or near London so eminently fitted for these purposes. The alternative site suggested by my right hon. friend was also examined in the hope that, if it proved suitable, there would be no necessity to deprive Kenley Common of its trees, but the conclusion was come to that it was entirely unsuitable for the purposes named, and that, owing to its natural formation, no human skill could make it suitable. There is no intention of erecting any buildings on the common, and my information is that such trees as are being cut down are, in the main, not old trees. I regret that even these should have to be cut down, or that the natural amenities of this public ground should be in any way injured; but I am informed that this had to be done on the grounds of urgent national necessity. I should point out that this common has a main road right up to the aerodrome, and is served by three railway stations. These have facilities for unloading machines, which in the case of an acceptance park are delivered by road and rail in pieces from the contractors, and that it has the additional advantage of having a main water supply and electric-feed cables within close range. I regret, therefore, that the work must proceed.

Sir F. Banbury: Is my hon. friend aware that no notice whatever was given to the corporation of the intention of the military to occupy this space, and that when the corporation found this out, through their keepers, the military official merely curtly said that he was going to do what he liked under the Defence of the Realm Act, and did not care for anybody; and whether, under those circumstances, it is not just that the corporation, who have no desire whatever to interfere with the devotion of proper space for an aerodrome should be heard as to whether or not the other site is not a more suitable one?

Mr. Macpherson: I am sorry if the corporation feel aggrieved by non-attention to the politenesses of life; but I feel assured that my right hon. friend will admit that they are not often omitted by officers of the Royal Flying Corps. When the right hon. gentleman says that no notice was given by them, I am loth to believe that on none of those occasions did they apprise the corporation or the keepers that they intended to make the examination. I have had this morning an opportunity of going into the whole of the facts of the case, and, as I said in my answer, we deeply regret having to take any public ground; but this matter, being one of extreme urgency, necessitated our taking the space. I can only again express my regret.

Mr. Morton: Was notice given to the Town Clerk of the City of London before they took possession of this common?

Mr. Macpherson: I cannot say. My attention was not directed to that particular point, but I will make inquiry.

On June 12th, on the motion for the adjournment of the House, **Sir F. Banbury** (City of London, U.) protested against the action of the military authorities in taking possession of Kenley Common without giving any notice to the Corporation of the City, as they were bound to do under the Act. He also quoted evidence to show, contrary to the statement of the Under Secretary, that there were other sites in the neighbourhood which were quite as handy and better suited for the purpose of an aerodrome. **Mr. Hugh Edwards** (Glamorgan, Mid, L.), speaking as Vice-Chairman of the local authority of Purley, the Guardians of Kenley Common, and **Sir Stuart Coats** (Wimbledon, U.) also protested.

Mr. Macpherson said, in reply, that the taking over of this land was done only after the most careful inquiry by no fewer than at least six of our great specialists in aeronautics. He was informed that they came to the conclusion that this site was the only suitable site in that part of London after the consideration of other sites. It was required not only for an aerodrome but for an acceptance station. This was very soon after the Folkestone raid, and it was necessary to take immediate action. It was only on May 30th that a conference was held of all the departments concerned, and on that afternoon a telephone message was sent to the Town Clerk's office in the City of London saying that it was arranged to take over Kenley Common for the purposes named. He was informed that Farthing Down was hopeless for the purpose of an aerodrome, and that it would be extremely dangerous for young pilots to make use of it.

[The idea of taking over Public Commons for aerodromes seems good, as it does away with the need for the purchase of private property, and prevents the transformation of food-producing ground into waste grass. But Kenley seems a curious place for an Acceptance Park. It is not within miles of any aircraft factory, and the use of it for acceptance trials means either a vast amount of unnecessary transport, or unnecessary flying of machines before acceptance. Apparently, the whole system of acceptance tests might be improved with advantage, as the newest methods appear to be less economical in time and man-power than were those in use under the A.I.D. One would like to be assured that Kenley Common was not chosen chiefly because someone interested in acceptance tests happened to find it convenient to his own residence.—Ed.]

Royal Flying Corps.

On June 15th **Mr. Billing** asked whether officers of the R.F.C. who failed to qualify as pilots, but who wish to continue in the flying Service, are allowed to qualify as observers, or whether, under such circumstances, they are asked to resign their commissions, and that being done, are subject to conscription as privates?

Mr. Macpherson: If an officer fails to qualify as a pilot, and wishes to become an observer, he is accepted for training, as an observer, if recommended. If not recommended, an officer who belongs to another unit is returned to his unit as an officer. If not recommended as an observer, but recommended and approved as suitable for another branch of the Service, he resigns his commission and joins a cadet unit. If not recommended either as an observer, or as an officer in another branch of the Service, he resigns his commission and becomes liable to conscription.

Special Courts of Inquiry.

Mr. Billing: Is the hon. gentleman aware that numerous officers at the present time are being relieved of their commissions in the Royal Flying Corps purely and simply through friction arising with their commanding officers in France, although they are capable pilots, and in these circumstances is he prepared to set up a small Court of inquiry, or some form of appeal for these officers, who at present have no form of appeal whatever?

Mr. Macpherson: I cannot accept the statement made by my hon. friend in the first part of his question.

Mr. Watt: Is the hon. gentleman aware of the great difficulties that exist in getting out of the rank of observer into that of pilot?

Mr. Macpherson: I understand that is not true. I understand that observers very frequently become pilots.

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On July 11th **Mr. Lynch** asked the Under Secretary for War whether, in view of the failure to protect London from a small force of German aeroplanes appearing in daylight, he will proceed without delay to effect necessary changes in the higher direction of London's air defences. **Mr. Macpherson** replied in the negative.

Mr. Macpherson, replying to **Mr. Billing,** stated that the official reports of the casualties in air raids included those sustained by naval and military men and Civil Servants. [Since what date?—Ed.]

Mr. Hogge asked how it was that the public had been informed this morning for the first time, through the medium of a Coroner's inquest, that one of our aviators had been shot down by the Germans on Saturday. **Mr. Macpherson** thought that did not arise out of the question.

Mr. Billing asked whether, having regard to the diametrically opposed results of our anti-aircraft fire from those anticipated whereby the German aviators were unscathed and our civilian population suffered, steps would be taken to provide more efficient anti-aircraft batteries both as regards guns and gun-crews, or protect the people of this country by removing the guns altogether. **Mr. Macpherson** said that the shooting of the London guns was observed from the ground to be good, and this is confirmed by our pilots in the air in the vicinity. Casualties from our anti-aircraft shells are inevitable if the public do not at once take cover, but the casualties would certainly be much greater if the enemy were unhampered by the fire of our guns.

Mr. France (L., Yorkshire, Morley): Will the Under Secretary lend Mr. Billing a machine, so that he may observe the gunfire from the air? (Laughter and cheers.)

Mr. Billing: Will the hon. gentleman give his serious attention to that request and grant it if possible?

[A pretty answer to Mr. France's ill-bred sneer. Nothing would please Mr. Billing better than the chance of seeing for himself.—Ed.]

Mr. Macpherson, answering Mr. Billing, said that no inquiry had been made at the Hendon Aerodrome of the Royal Flying Corps as to any incident which occurred there preceding and during the enemy air raid over London on Saturday last.

Sir H. Dalziel (L., Kirkcaldy): Is it the case that the few machines that went up were machines that were waiting there to be tested and were in such a condition that some of them had immediately to come down? **Mr. Macpherson** said the right hon. gentleman might have given notice of a question like that.

Mr. Hogge (L., Edinburgh) asked permission to move the adjournment of the House on a definite matter of urgent importance—the revelation by a Coroner's inquest of facts concerning the recent air raid, which had been officially concealed. **The Speaker** said he did not think that could be taken as a matter of urgent public importance.

Mr. Hogge urged that it was a matter of urgent public importance that War Office communiqués should be accurate. A Minister had said that all the casualties were included in Sunday's communiqué, whereas this Coroner's inquest revealed that they were not. **The Speaker**: Does the hon. Member say this casualty was not included? **Mr. Hogge**: Yes.

The Speaker: The hon. gentleman says it was. **Mr. Hogge**: It is not true. **The Speaker**: I don't think this is a matter that can be held to be of urgent public importance.

[One has on occasion thought that official communiqués are not of public importance, and that one need not altogether rely on their accuracy, but one is none the less surprised at the Speaker's statement.—Ed.]

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On July 12th **Mr. G. Faber** asked the Under Secretary for War whether he could state whether any British aeroplanes were lost or damaged in the German air raid on July 7th. **Mr. Macpherson** said that it would not be in the national interest to make any information public on this point, but he would answer privately.

Mr. G. Faber asked whether it was not a fact that when certain of our aeroplanes tried to rise from the Hendon aerodrome it was discovered that their engines had been tapped. **Mr. Macpherson** replied that he could not answer that. **Sir H. Dalziel** (Kirkcaldy Burghs, L.): How many of our own machines were brought down by our guns?

On the motion for the adjournment of the House,

Mr. Hogge called attention to the air raid of Saturday last, and inquired how far the official communiqués represented an accurate account of what happened.

Mr. Macpherson promised that if the hon. Member could produce any specific incident or aircraft accident that ought to be inquired into he would do his best to see that inquiry was made. It was a fact that at certain times aeroplane squadrons might be taken from the air defence of this country for the front. He informed the House that the Prime Minister and General Smuts were personally looking into the position of the aerial defence of London.

* * *

On July 13th **Mr. Outhwaite** (L., Hanley) asked the Under Secretary for War whether, during the past years, the lives of French aviators had been sacrificed on the Western front to the same extent as had the lives of British aviators, and, if not, could he give any explanation.

Mr. Macpherson said he was not aware that our casualties had been more than those of the French, but if they were it was simply because the air fighting had been more severe on the British front.

Mr. Outhwaite: Can the hon. gentleman say whether any French Government or Commander-in-Chief would be permitted to sanction such losses as have taken place in our Army? It is asking them to commit suicide. (Cries of "Oh, oh.") Of course, you don't care how many are killed. (Renewed cries of "Oh.")

The Speaker: If the hon. Member takes the opportunity to make offensive insinuations I shall have to call upon him to withdraw. (Cheers.) I warn him that the House will not stand offensive insinuations of that kind. (Renewed cheers.)

[As a matter of fact the French have seldom been so well equipped or organised as the R.F.C.—Ed.]

* * *

On July 16th **Sir G. Cave**, in answer to a question by **Mr. Billing** as to the system it was proposed to adopt to warn London of pending air raids, said:—Considerable progress has been made in this matter. What is required is, first, that we should have reliable information when enemy aircraft are actually approaching London, and, secondly, that we should have efficient means of warning the public of their approach. As to the first point, the military authorities have promised their co-operation, and machinery for obtaining the necessary information is therefore now available and will, I understand, be improved. As to the second point, certain sirens have been tested and others will be tried to-morrow. The local authorities have been asked to suggest sites for the sirens and otherwise to assist in the arrangements for the public warning. As soon as these arrangements are completed a public announcement will be made describing the system adopted and containing instructions for securing the public safety in the event of a raid.

Mr. Billing: Was the warning of Saturday a rehearsal or a genuine air raid warning? **Sir G. Cave**: No public warning should have been issued on Saturday. The usual preliminary notice of a possible air raid was received and circulated to the police. At a few stations the officers in charge misunderstood their instructions, and instead of waiting for the second warning, "Take cover," allowed the police to go out.

Replying to **Mr. Brookes, Mr. Macpherson** said. Excluding night flying machines, 59 per cent. of the aeroplanes in possession of those Home Defence squadrons which can take part in the defence of London are first-class fighting machines.

Mr. Brookes asked whether the anti-aircraft artillery employed in the defence of London was of the latest pattern; whether any of the gunners had had experience at the front; and how many opportunities really existed for effective practice.

Mr. Macpherson: The reply to the first part of the question is in the affirmative. As the personnel are mainly Home Service men they have had practically no experience at the front. All detachments have periodical practice firing.

DR. ADDISON ON PRODUCTION.

Dr. Addison, Minister of Munitions, in a statement made on July 11th, said that the development of the aircraft industry was one of the biggest tasks the Ministry had to face. Since last January, when the Ministry became responsible to the Flying Services for supply, the programme had been steadily and largely increased. It was still expanding, and no limit could be set to it till we had enough aeroplanes and seaplanes both for attack and for defence. He added:—

"No fewer than 1,000 factories are engaged on some process or other connected with the construction and equipment of the flying machine. Output is increasing by leaps and bounds. If for the purposes of comparison you put the number of aeroplanes produced in May, 1916, at 100, then in May of this year the number rose to rather more than 300. Even this rate of increase is being accelerated. The output in December will be twice what it was in April, and the December total will be far surpassed in succeeding months.

"The number of aeroplane engines turned out monthly has been more than doubled this year already and this total will be doubled again before the close of the year.

[Which would be excellent hearing if one believed that a proper proportion of them were fit for war use, and were not officially designed wash-outs.—Ed.]

"What these figures involve in organisation will perhaps be appreciated when it is stated that a single cylinder of the rotary engine involves 48 different operations in its manufacture. As for spare parts, an enormous number have to be manufactured, as, owing to the fragility of the machine, its parts require frequent renewal, and 'spares' must be ready to hand whenever and wherever wanted.

"A growing number of workers are employed in the aeroplane factories, the increase in the last five months being 25 per cent. on the previous total. Along with this the replacement of skilled workers by women has gone on, the dilution percentage having arisen from 19 per cent. to 37 per cent. To meet the demand for labour special schools have been started all over the country, where a training of about two months qualifies a pupil to carry out some simple process in aeroplane manufacture. About 100 qualified workers are supplied each week under this system. Yet the demand is not satisfied. More and more women are wanted, both in London and in the provinces; and women of good education and good physique can render the nation no better service at the present time than by undergoing the training which is offered in these schools.

Changes due to New Inventions.

"The Ministry of Munitions has had special difficulties to overcome to reach the present degree of output and efficiency. The technical development of the aeroplane has presented peculiar problems. New types are continually being evolved. It has never been possible to say, 'This is the final form the aeroplane will assume,' and lay constructional plans accordingly. Those responsible for the manufacture of our flying machines have always had to allow for a new invention coming along and revolutionising all their projects.

"Speed, climbing power, armament have continually increased and improved since the outbreak of the war. An engine that can develop up to 350 horse-power, for example, and a single-seater scout, able to travel at 150 miles per hour, are built on very different lines from their prototypes of August, 1914. Where there is no finality there is a limit to standardisation, except in small details, and the problem of supervising the manufacture of our aeroplanes is correspondingly complicated.

[Then why standardise on obsolete types?—Ed.]

"The variety of materials used in aeroplane construction, again, has been a great source of anxiety to the Ministry. Linen, timber, chemicals for tightening the fabric of wings, alloy steel, light alloys, thin tubes are among the essential requirements of the industry. Even if these were wanted in normal quantities, there would be difficulty in getting enough in view of other necessities. But the needs of the aeroplane programme are enormous, almost passing belief. For our present programme of construction more spruce is wanted than the present annual output of the United States, more mahogany than Honduras can supply—and Honduras is accustomed to supply the requirements of the world. Besides this, all the linen of the type required made in Ireland, the home of the linen industry, and the whole of the alloy steel that England can produce can be used. As for flax, to meet the needs of the Air Service the Government has actually to provide the seed from which to grow the plant essential for its purposes. Still, despite the magnitude of the demands, all the needs of aeroplane manufacture will be met. The programme before the Ministry of Munitions is that of a maximum production."

[If the Ministry would turn its attention to reducing the amount of "scrap" produced by unnecessary rejections, and by foolish cleverness in official designs, it would not need anything like so much material.—Ed.]

AN ENGAGEMENT.

The engagement is announced of Mr. A. Dukinfield Jones, second son of Mr. E. Dukinfield Jones, of Castro, Reigate, Surrey, to Evelyn, daughter of Mr. Hugh Tennent, of 5, King's Gate, Glasgow, and Holland House, West Kilbride, Ayrshire.

Mr. Dukinfield Jones is well known to the older hands in the Aircraft Industry for his association with Mr. Howard Flanders at Brooklands. At the dissolution of the Flanders firm, he joined the D.F.W. firm of Leipzig as test pilot, and it is interesting to note that he got performances from the well-made but heavy D.F.W. machines, which exceeded the best efforts of the late lamented Herr Roempler, who was so popular at Brooklands before the war.

Mr. Dukinfield Jones has since the outbreak of war been engaged upon test work for Wm. Beardmore and Co., Ltd., at Dalmuir, Scotland, and is recognised as being one of the most experienced and reliable pilots in the country. His many friends will wish him and his bride-to-be every happiness.

A FRIENDLY ENEMY.

By the way, the earlier readers of The Aeroplane may be interested to know that those who were in Flanders early in the war state that Herr Roempler was shot down and killed near Dunkirk while making a sportsmanlike journey to drop effects and letters from captured British officers in German hands, and while carrying a note conveying his regards to his friends at Brooklands.

OUR MAN-POWER.

The following letter has been received:—

Sir,—I have been a manufacturer of Cabinet Letter Files, and have, therefore, a knowledge of joinery.

Owing to circumstances, which would take too long to explain on paper, I have had, for some few years, to be content with indoor (office) work—as a French translator.

On applying to the much-placarded "St. Ermins," I was dispatched to ,Messrs. So-and-so's factory at ———; but being without tools and (at that time—about 10 days ago) without prospect of buying any—I obtained no work. I am now in a position to buy tools, and four days ago wrote a letter to Messrs. So-and-so asking for a re-decision in favour of taking me on. But no answer has come during four days.

Yet, last week's papers (under the heading of "Strikes and Munitions") contained a speech of Sir L. Worthington Evans, M.P., in which he is reported as saying:—

"Guns, aeroplanes . . ., are still wanted for an overwhelming concentration along the Front. That makes a further dilution of skilled labour with semi-skilled and unskilled, absolutely necessary."

I am 45, active, abstainer—and my abilities (for much of the building work of an aeroplane) are well within the "semi-skilled"; yet, for want of a little influence, I am obliged to walk idly, whilst much of the remaining work (such as doping) is (so Messrs. So-and-so say), actually given to girls!

I can produce an eight years' reference (1909-1917) to one of the largest engineering firms in London.

(Signed) C. Fitzgerald.

[One suggests that potential aircraft makers without tools might be supplied with them by the manufacturers.—Ed.]

A FIGHTING FAMILY.

Comment has been made in The Aeroplane on the many occasions on which officers of the name of Bell-Irving have appeared both in the "Gazette" and the Honours List. It has now leaked out that there are no less than six sons of Mr. H. O. Bell-Irving, President of the Anglo-British Canadian Packing Co., of Vancouver, at work with the British Forces. These are Lieut. Henry B. Bell-Irving, R.N.V.R.; Major Richard Bell-Irving, R.F.C.; Major Roderick Bell-Irving, M.C.; Capt. M. Bell-Irving, D.S.O., M.C., R.F.C.; Capt. Duncan Bell-Irving, M.C., R.F.C.; Lieut. Æneas Bell-Irving. It is reported that someone has remarked that they are all "red-blooded, red-haired, and red-fibred, with grit marked all over them." The grit mentioned has no reference to the results of disintegrated landings on aeroplanes. The phrase has a psychic and not a physical implication.

MORE AMERICAN OPTIMISM.

A message from New York dated July 12th states that Mr. Cox, Governor of Ohio, addressing a meeting in Indiana, expressed the opinion that American aviators flying in American aeroplanes would bring the war to an end. "From facts in my possession," he said, "I have formed the positive belief that American aviators will break into the skyline of Germany like birds in migration, not to kill women and children or commit human slaughter in any form, but American bird-men, having reached Essen and Kiel, will destroy not only Germany's navy, but every institution which perpetuates the menace of Prussian Imperialism."

[First build your aeroplane, Uncle Sam.—Ed.]

SCENES IN AN AIRCRAFT FACTORY.—XVIII.—THE DRAWING OFFICE.—In the right foreground a slide-rule expert endeavours laboriously to work out the capacity of a tank, while the office-boy merely finds out empirically with a tin measure. To their left a messenger becomes involved in blue prints, while another office-boy discourses sweet music, to the chagrin of an "x-chaser," who is trying to keep cool and collected. Beyond him, another human calculating machine also tries to keep cool, and, beyond him, again, a mere rule-of-thumb draughtsman gets his dimensions with a foot-rule. In the middle of the picture an R.N.V.R. and an R.F.C. inspector discuss a technical point, with the firm's chief draughtsman as a strictly neutral spectator. Next them, two representatives of our Allies converse amiably. To the right, a mathematical expert, who has given way under the stress of war work is firmly but gently removed. In the left background an assistant endeavours to measure a "fair-lead," and expresses his opinion thereof to the astonishment of a juvenile tracer. Alongside her, other tracer-ladies are seen at work.

TRADE CARDS.

TRADE CARDS.

MISCELLANEOUS ADVERTISEMENTS.

ENGINEERING.

AIRCRAFT PARTS.

MODELS.

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PUBLICATIONS.

Continued on page 208.

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SITUATIONS VACANT.

About to build Flying Boats! Required experienced boat builder accustomed to this type of work. No one on Government work need apply. Applications must be made through nearest Employment Exchange, mentioning this paper and Box No. 1181.

Jig and Tool Draughtsman required, aviation works, near London. Good man required. No person resident more than 10 miles away or already engaged on Government work need apply. State age, salary and experience. Write Box 550, Samson Clark and Co., Ltd., 58, Portland Street, W.1.

Mechanic to take charge of experimental trials. Experience of engine running and aeroplane erection essential. Reply stating experience and wages required. No one residing more than 10 miles from the N.W. London district or already on Government work need apply.—Write 243, Sell's Advertising Offices, Fleet Street, E.C.4.

Draughtsmen required by aeronautical engineers, London, N.W., preferably with experience of aeroplane construction. No one living more than 10 miles away or engaged on Government work need apply.—Write giving age and salary required to 238, Sell's Advertising Offices, Fleet Street, E.C.4.

Joiner-Erector wanted immediately. No one residing more than 10 miles away or engaged on Government work need apply.—Write stating age, experience, remuneration required to Box No. 1196, THE AEROPLANE, 166, Piccadilly, W.1.

Storekeeper. Wanted immediately. Reliable and experienced man, ineligible, to take charge and supervise in and out going material in controlled works, Newcastle district. No one already engaged on Government work need apply.—Apply your nearest Employment Exchange, quoting No. A. 3409.

Woodworkers used to planing and spindle machines. Men on Government work or residing over ten miles away need not apply. Good wages. Apply personally at ten o'clock any day to the Aircraft Construction Co., Harley Aeroplane Works, Beckton Road, E. 'Phone: East 1300.

Sheet Metal Workers for aeroplane work. Men on Government work or residing over ten miles away need not apply. Good wages. Apply personally at ten o'clock any day to the Aircraft Construction Co., Harley Aeroplane Works, Beckton Road, E. 'Phone: East 1300.

Draughtsman-Designer with good previous experience in lighter-than-air aircraft design, to take charge of design section for Military Kite Balloons. No applicant already on war work will be considered unless in position to obtain release certificate. Candidates must be prepared to show that they are of British birth and British parentage.—Apply Room 817, Air Board Office, Strand, W.C.2.

Experienced tank foreman required to take charge of shop in London manufacturing tanks, cowls, etc. No one residing more than ten miles away or already engaged on Government work need apply.—Apply Hall, Baylis and Co., 70a, Brooke Street, London, E.C.

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Good salaries attract men. An organisation of high-grade men attracts business. The rule works both ways.

Those applying will please state age, height, weight, whether married or single, technical training, practical experience, concerns worked for and capacity, time employed and reasons for leaving, work specialised on and references. No person engaged on Government work or living more than 10 miles away will be employed.

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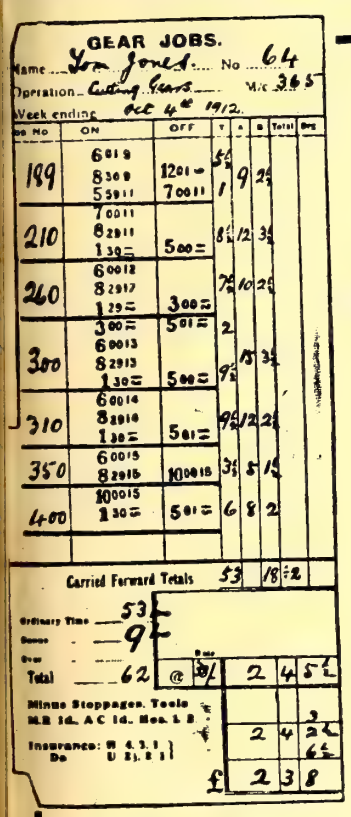
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No.	On	Off	Y	A	B	Total	Brot
199	6 01 9 8 30 9 5 59 11	12 01 = 7 00 11	5½	1	9	2½	
210	7 00 11 8 29 11 1 30 =	5 00 =	8½	1	12	3½	
260	6 00 12 8 29 17 1 29 =	3 00 =	7½	1	10	2½	
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300	6 00 13 8 29 13 1 30 =	5 00 =	9½	1	5	3½	
310	6 00 14 8 29 16 1 30 =	5 01 =	9½	1	12	2½	
350	6 00 15 8 29 16	10 00 15	3½	5	5	1½	
400	10 00 15 1 30 =	5 01 =	6	8	2		
		Carried Forward Totals	53	18	2		

Ordinary Time 53

Bonus 9

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ON THE NEED FOR A CARTER.

What a beautiful day it will be—if it ever comes—when one can sit down and write an unqualified eulogy of the equipment of the Flying Services. Nothing would give such joy to the present writer, and yet the day seems as far off as ever.

If one wrote only of the things that are good—and there are many—one would be merely assisting the slackers and intriguers. Every eulogy would be appropriated by them, just as the fulsome eulogies which appear in the daily news-sheets "on high authority" from time to time are inspired by them. And the spirit of "all's well in this best of all possible worlds"—for "worlds" read "Services"—is that most of all calculated to lull the lazy Englishman into a sense of comfortable security, and to encourage him to do as little work as possible.

Every step forward, hitherto, in all Government departments, but specifically in the Flying Services, has been the result of agitation. Every improvement has been the result of a minor revolution in one department or another. As a born and bred Whig of the old school—which in these days really means a case-hardened Tory—I hate revolutions, and revolutionaries themselves are an abomination to me. Therefore, I view all these agitations with regret, for I know that the chief cause of Industrial Unrest, and of some lack of enthusiasm for war, is the result of agitations which have destroyed the people's confidence in their leaders.

The leaders themselves are to blame, for if they had led the people properly, and had appointed efficient subordinates who would have inspired the people with confidence in official ability instead of impressing on them the utter inadequacy of officialdom, the people would have followed their leaders to perdition or to victory with cheerful enthusiasm. As it is, ineffective officials in all grades have destroyed the belief of the people in their leaders, and the task of the really able men is made all the harder, not by agitators, whether German-paid or merely anarchic, but by their own colleagues in official or Service positions.

The people do not mind sacrifices. They do not mind privations. They are not cowards. They are not afraid of their enemies. But they do hate to think that their sacrifices are unnecessary, or useless, and that they are being "sold a pup" by the people who ought at once to lead and serve them. That is the real cause of all this labour unrest, and revolutionary gossip.

The Devil and the Deep Sea.

Therefore, the critic is more or less between the Devil and the Deep Sea. If he cries "peace where there is no peace," and pretends that all is well with our Government departments, he is merely aiding the incompetents to hold down their jobs, and is helping to make inefficiency more inefficient. If he agitates for reforms and for the giving of a free hand to efficient men, he cannot help adding to the spirit of unrest which will become a definite danger to the carrying on of the war unless it is crushed. It may be crushed partially by force of arms, at the price of something very like civil war, but it can be destroyed altogether if we can only find some great leader who will take hold of the reins and inspire the people with confidence and enthusiasm.

The Flying Services are typical of the people and the British Empire as a whole. The world of aviation is a microcosm of the world at large. We have our own agitations, and the same results. One would like to say that all is well, yet one cannot honestly say it, for the reasons stated. And one is forced to agitate and criticise, for here we have Lord Derby, Mr. Lloyd George, and Dr. Addison, all within a week, lamenting that we cannot produce, or rather that we have not produced, enough aeroplanes to supply the Army in the Field, and also Home Defences. And why not, pray? We have the labour and the machinery and the material. More especially we have the designs. Never has it been more true than to-day that we are always six months ahead of the enemy in design and twelve months behind him in delivery. And why are we behind?

Mesopotamia Over Again.

The answer is the answer to the Mesopotamian scandal: lack of preparedness, lack of organisation, reckless optimism on one hand, criminally bad technical advice in another, and through it all personal intrigue. A man tries to aggrandise himself at the expense of another; a department tries to save its face by covering up its mistakes instead of admitting them freely and making good at the next attempt; a clique stores up technical information for its own benefit instead of spreading its knowledge broadcast for the good of the Services; one office disapproves the action of another lest the success of the said action should bring credit and promotion to the originator of the idea; an official condemns the design of a civilian engineer lest the civilian's designs should supersede those for which he himself hopes to win advancement.

And so the miserable game goes on, with the result that the men at the front suffer for it. But now, thanks to that long-suffering star which presides over the destinies of this country, the people at home are beginning to suffer also, with the inevitable consequence that the responsible officials are being badgered to explain why.

Our friends the enemy may yet force us to win the war. A few more really healthy air raids over London and there may be such an upheaval as will finally remove that portion of the population of the Hotel Cecil which has all along been responsible for our constant unpreparedness and for our slowness to rectify our mistakes. Meantime one has to go on criticising.

A Typical Example.

Be it said, the responsibility is fairly well spread out over various departments, but primarily the reason for the shortage of aeroplanes is the waste of material and labour which has taken place in the past. The older readers of this paper will remember, for example, the agitation two years and more ago against the waste of labour and material on B.E. biplanes and R.A.F. engines, when better performances could have been got out of other designs which were simpler and cheaper to build.

When I appeared before the Air Enquiry Committee a year ago I asked why, instead of building R.A.F.—B.Es., we did not build Avros, with mono-soupape Gnômes. General Henderson himself distinctly suggested to the Committee in reply to this criticism that mono-Gnômes could not be used in tractor machines. Yet at that moment the R.N.A.S. were using monos. in Schneider-type Sopwiths with marked success, and to-day any R.F.C. officer can tell you all about mono-Gnôme-Avros.

No 90-h.p. R.A.F.-B.E. ever had a performance equal to that of a mono-Gnôme-Avro, even the officially mangled version. No B.E. could ever be built as cheaply in labour and material as an Avro. Also a mono-Gnôme was even then a far cheaper engine to build than a R.A.F., and its cylinders were not classed as consumable stores, as were R.A.F. cylinders. The amount of scrap produced in building Avros and Gnômes was infinitesimal compared with the wastage in B.Es. and R.A.Fs., and yet we built the latter in thousands all over the country. They cost more in labour and material without allowing for wastage, they produced more scrap, they did not climb as well, they were not as fast. Yet we went on building them, and we are still building them to-day. And so we found ourselves without fighting machines to tackle the Fokker scourge of late 1915, without better fighters to tackle the Albatroses of late 1916, and without sea-planes of a kind fit to tackle the submarines of early 1917.

To-day we find ourselves without big bombers to defeat the modern raiders by destroying their bases, and without enough aeroplanes of all sorts to carry war into Germany and influence materially the course of the war. Yet the people of this country, and the Government, have never discovered the reason.

Why? For much the same reason that the Government never discovered the iniquities of the hospitals on the Tigris, although thousands of us here at home knew all about them. Because the Army and the Government, and the tax-payers have been hoodwinked by the technical people, who had to save their faces or lose their jobs. And the same thing is going on to-day, and will go on until the Flying Services produce a Colonel Carter, to do for their technical people what that truly patriotic officer did for the medical people in Mesopotamia.

The Leaven of Righteousness.

I am not denying that much excellent work has been done, and is being done by many officers in the technical departments, but the good men are being held down and hampered by others, who are their inferiors in ability even if their superiors in influence or in rank, and until the Air Board takes the whole subject firmly in hand and shakes out the wasters we shall never reach our maximum output of aeroplanes and engines.

All must sympathise with the Air Board's difficulties. Men like Lord Cowdray and Sir William Weir, themselves unacquainted with the details of aircraft construction, cannot go down into that rabbit-warren of officers and find out where the intrigues begin and where the mistakes are made—and hidden. They can only hope for enlightenment when they deliberately lay themselves out to short-circuit the intriguers and hiders of mistakes. And, as I have suggested, they will only succeed in their task when they have succeeded in establishing personal communication with an officer or officers who will tell them the truth about what is going on underneath them, as Carter of Mesopotamia told the truth in spite of menaces and threats from those who knew they would suffer when the truth came out.

ON SOME DIRECTIONS FOR SEARCH.

Possibly it may assist the output of the aircraft, which we admittedly need, if I endeavour to suggest some of the directions in which search should be made if the Air Board is anxious to discover why it does not produce more machines for its expenditure of labour and material. Such suggestions must necessarily be made with due regard to the fact that anything herein written will be read by the enemy, and that, therefore, it is impossible to be very specific. At the same time investigations along the lines indicated may bring valuable results.

We are holding our own in the air abroad, as the enemy well knows, and for that fact we must thank not only the gallantry of our aviators, but the good work done by many people in the production departments at home. That, however, is not enough. We must produce such an air fleet as will overwhelm the enemy in the air and make it impossible for him to spare machines for the invasion of this country.

The more the war progresses the more evident is the truth of General Brancker's dictum to the effect that, though it may be impossible to prevent an enemy from reaching this country if he once starts, it is possible to produce such an air fleet as will prevent him from starting. It is with this object in view that I venture to direct the attention of the Air Board to the following points.

In the first place, no aeroplane, big or small, can fly without an engine. Have we ever had, and are we now getting, our maximum output from our engine factories? Barring the Sunbeam, Beardmore, and Rolls-Royce firms, has any motor factory turned out as many engines fit for war service on aeroplanes as it should or could have done? Has the Air Board considered the amount of first-class labour and material and machinery which has been and still is being wasted in motor factories in turning out inferior or obsolete machines of official or semi-official design?

Why should such a vast number of our active service pilots still be wandering about on 90-h. and 120-h.p. R.A.F. engines, when every Hun pilot can go prancing round the sky on 160-h.p. or 260-h.p. Mercédès or Benz engines? Who is responsible for the refusal of the original Hispano-Suiza offer, and, still more, who is responsible for certain happenings in connection with a revised Hispano-Suiza design ordered in vast quantities in England? And why was it a failure?

Has the Air Board investigated the latter affair, and has it realised its effect on the output of war-engines during the last few months? If so, who has suffered for the mistake, those in comfortable offices who altered or passed the designs, and gave out vast orders for untried engines, or those on active service who have not had the engines which they should have had?

Furthermore, does the Air Board know the whole truth about the material and labour and machinery expended over a certain unsuccessful engine known only by its initials? By whose order or by whose influence was that expenditure incurred? And will officialdom ever dare to make known the truth about the American deal which did *not* fructify. Great credit is due, at any rate, to one official who refused to see that deal through despite pressure from persons unknown and came home unbidden.

If the Air Board knows the inside of those two incidents it may prevent such reckless optimism and such colossal gambling in "futures" in time to come, but someone must pay for the mistakes, and someone should be punished for making them. Yet knowing our official methods it would be surprising if anyone has suffered so far—excepting always the people who want more and better aeroplanes and have not got them.

It sounds very well for Dr. Addison to boast that the number of engines turned out monthly has more than doubled this year already and will be doubled again before the close of the year, but quality is more important than quantity. Can Dr. Addison assure the nation that a proper proportion of these engines is fit for active service and not merely for school work? Here is a useful subject for Dr. Addison's successor, Mr. Churchill, to investigate for a beginning.

Mr. Churchill's Chance.

There is some hope to be found in the fact that aircraft production is largely under the thumb of the Ministry of Munitions, and the appointment of Mr. Churchill to the head of that department leads one to believe that aircraft constructors will have powerful backing in time to come.

Mr. Churchill has his faults, like every other big man, and he has a wonderful collection of enemies, but, at any rate, Mr. Churchill has energy and imagination, and he does not suffer fools gladly, so one may reasonably expect that any such mistakes which may be made in the future will be set right quickly, and that the originators of the mistakes will suffer for them.

Mr. Churchill's keen personal interest in everything concerned with aircraft is practically a guarantee that the sections of the Air Board which come under the Ministry of Munitions will be well looked after. Which ungrammatical sentence has a double meaning, in that one may look after a person in a disciplinary sense as well as looking after his needs and comforts. Short of becoming President of the Air Board there is no position in which Mr. Churchill could influence the output of aircraft so well as he will be able to do in his present office.

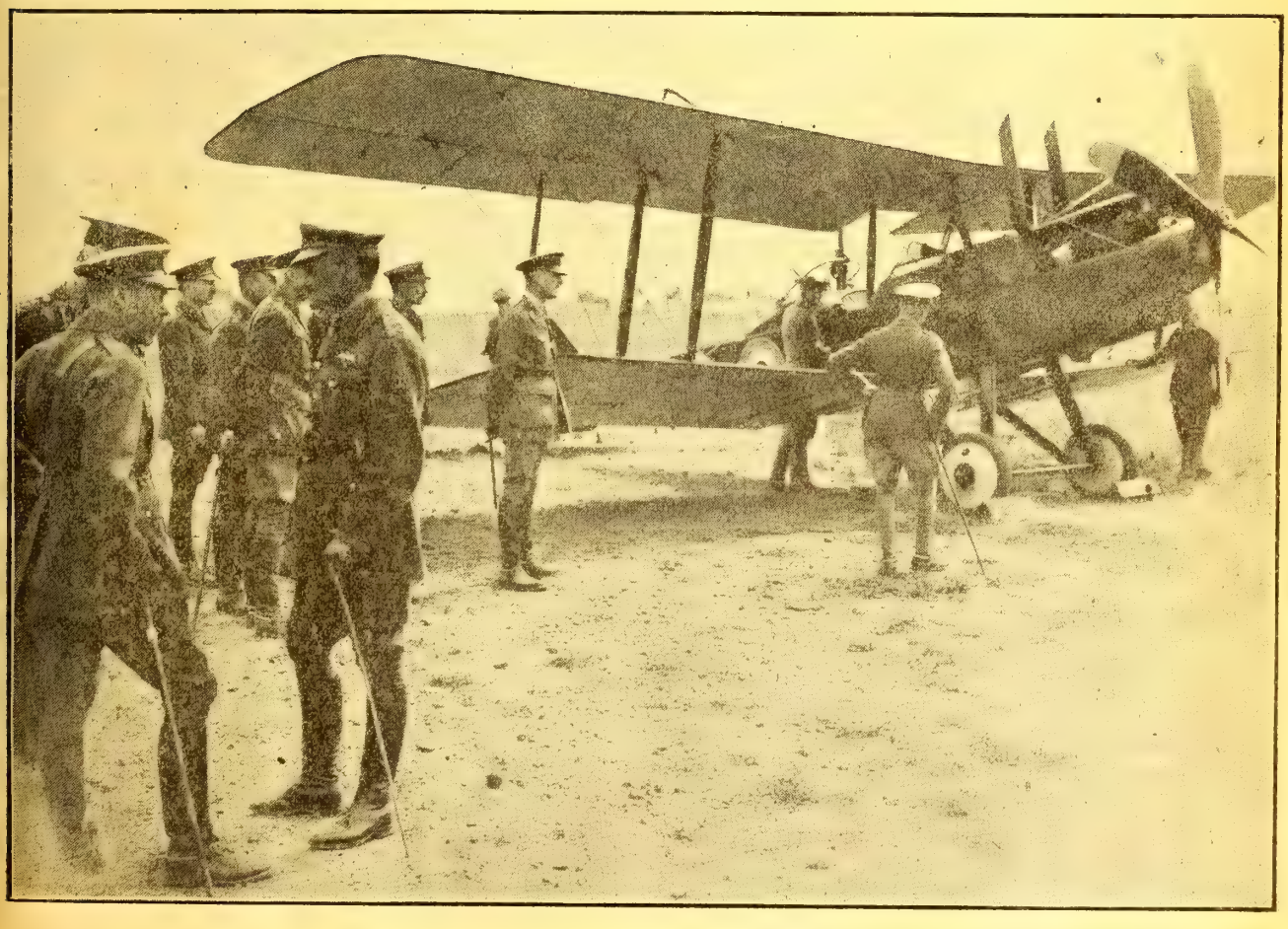
Improving Output.

However, to return directly to problems of output. It does not seem that we are using our sources of supply to anything like the best advantage. For example, engine output could certainly be increased if more liberty were given to manufacturers to farm out the making of small parts.

There are plenty of small firms, possessing a few lathes and other machines, who could take on sub-contracts for valves, or rockers, or such things, if the bigger firms were allowed to order these parts without official interference, so long as they also took responsibility for their quality.

Aeroplane parts also could be farmed out to a much greater extent, and there is no very evident reason why every little sub-contractor should be afflicted with A.I.D. inspectors and official forms and regulations, so long as the chief contractor has to stand the racket if anything goes wrong.—C. G. G.

(To be continued.)



Reproduced from the Official Photograph

THE KING WITH THE R.F.C.—His Majesty talking to General Becke. The Prince of Wales' apparent attitude of critical inspection towards the comic officially-designed aeroplane appears to be wholly justified.

MR. CHURCHILL'S APPOINTMENT.

From the "London Gazette," July 21st, 1917.

The Privy Council.

At the Court at Buckingham Palace, the 20th day of July, 1917.—Present, the King's Most Excellent Majesty in Council.

This day the Right Honourable Winston Leonard Spencer-Churchill was, by His Majesty's command, sworn Minister of Munitions.

Almeric FitzRoy.

Mr. Churchill's return to the Cabinet has been the subject of much adverse criticism, for, like all strong and energetic men, Mr. Churchill has made many enemies. Also doubtless, he has made mistakes, for there is an excellent old proverb to the effect that the man who never makes mistakes never makes anything else. Nevertheless, the indisputable fact remains that, in so far as aeronautical affairs are concerned, Mr. Churchill's activities have had wholly good results. As First Lord of the Admiralty he grasped the importance of naval aviation, and, despite the opposition of stick and string admirals and parsimonious Treasury officials, he succeeded in giving to this country at the outbreak of war the only effective Naval Air Service in the world. And it was no fault of his that the R.N.A.S. failed to develop along the lines on which he started it.

His efforts in this direction kept the Aircraft Industry alive when, if it had been dependant on the Army, it would have ceased to exist, barring a few obedient firms solely employed on manufacturing to ineffective official designs. It was entirely due to Mr. Churchill's backing at the most critical time of its existence that the Aircraft Industry was able to supply aeroplanes and engines to the R.F.C. when it had been so badly let down by the Royal Aircraft Factory.

Mr. Churchill is himself a capable pilot of aeroplanes, and his quick grasp of new ideas enabled him to appreciate at once the problems of the Air Service. As Minister of Munitions the problems of aircraft supply will come within his purview, and one is encouraged to hope that his early enthusiasm for flying, coupled with his present appreciation of the vital importance to this country of an adequate air fleet, will move him to devote to the production of aircraft all the attention which he can possibly spare from the other duties of his department.

It is probably impossible by now for any human being to evolve order out of the chaos of the Ministry of Munitions, but a policy of Hunnish ruthlessness, in the way of scrapping departmental chiefs who do not make good, may make the Ministry effective even if it can never be made efficient. One has considerable respect for Mr. Churchill's ruthlessness where immediate results are demanded, and, therefore, one has great hopes that he may once more be instrumental in placing this country in a position of pre-eminence where the matériel of air war is concerned.—C. G. G.

AIR RAID WARNINGS.

The test of sirens as a means of giving warning of threatened air raids on London was made on July 17th. Some minutes after 12 o'clock the test began, and it continued until about 12.30 p.m. There seems little doubt that the experiment was not a success, and the general opinion is that some better system of warning must be adopted.

Steamers on the Thames, the fire-tugs, and steam whistles on various factory buildings started first, and their notes were heard by all the people living or working near the river bank. Beyond these limits they were inaudible, and in many parts of the City of London people who had been waiting for the alarm did not hear it at all, owing to the noise of traffic. In office buildings in the City clerks and workpeople did not know that a warning had been sounded, even though they had been waiting for the test.

[It has been suggested that a more practicable system would be the simultaneous ringing for half a minute of every telephone bell in London, and the imposition upon subscribers of the duty of attracting the attention of passers-by to the fact that a raid was expected.

Another suggestion is the fitting of electric motor horns at street corners, to be coupled to telephone wires and sounded from the telephone exchanges. A large number of such horns could doubtless be procured from the owners of cars which have been laid up owing to lack of petrol.—Ed.]

A trial was made on July 20th at the Horse Guards Parade of a new method of signalling the approach of enemy aircraft. At 4.30 p.m. a small crowd gathered near the parade ground, and shortly afterwards the Prime Minister and Lord Derby appeared to watch the tests. With them were Sir George Cave and Lord Milner.

A small brass cannon attached to a length of wood about the size of a railway sleeper was used to fire the detonators, technically known as Sound Signals. These were tried first, and were evidently the most effective. When they leave the cannon they detonate with a loud report, and in the air, at a height of about 200 ft., they explode again with a louder noise than that made by the propulsive charge. There is an interval of five seconds between the first report and the second, and this in itself would constitute a signal.

The other method tried was not such a success. It consists of a rocket fired from a papier-maché mortar, which bursts at a height of about 150 ft., setting free a parachute, from which is suspended a smoke flare, or a series of calcium lights. They made little noise as they left the ground, and but a feeble report reached those listening when they burst in the air.

It was evident that the sound signals were the more effective. Of course people a mile and a half away from the scene of the firing could not hear them, but when the system is properly in swing everyone in London possessed of ordinary hearing will know that the warning has been given. It is proposed that these mortars should be placed on various buildings about the City so that they can be fired by the police or other officials on the approach of enemy aircraft.

In consequence of the arrival of enemy aircraft over the Eastern coast on the morning of July 22nd, London was officially warned through the agency of percussive pyrotechnics that a raid was to be expected. One would imagine that the imitation of an air raid would be *très difficile*, to borrow the expression of the historical French personator. But it was attended with such success that the greater part of the population was absolutely convinced that they were being bombed. In all, 237 rockets were fired from the 79 fire stations in the L.C.C. area, and in all the chain of warnings was spread over a period of about 10 minutes. This auricular notice was supplemented by the display of boards in the hands of, round the necks of, or on the protuberances of policemen.

Although one is inclined to agree that the average person has no right to be in bed at 8.30, there are many circumstances under which one is justified in being asleep at any hour of the day or night, and personally one would like the future notices to be given in a somewhat less distracting way. At the same time, considering Londoners' wilful deafness to advocates of adequate aerial defence in the past, one is quite prepared to sacrifice one's own personal comfort for the solid satisfaction of seeing London forced to listen to aerial agitations—even when officially afflicted.

It might be better if all the signals could be let off simultaneously or in three discharges, as apparently it was intended that each district should be notified thrice. Apparently London was notified 237 times, which seems well on the liberal side.

The many thousands of invalids who have to live in London certainly deserve a little consideration, as do the number of nerve-wracked soldiers who at the present time are helping to fill the hospitals, and one doubts whether the rest of London is worth the discomfort thus caused to them.

PRINCESS MARY'S ESCORT.

The "Star" states that a letter sent to the Mayor of Southend by Sir Edward Wallington, private Secretary to the Queen, contained the following passage:—

"Her Royal Highness was much gratified by the warm welcome she received from the inhabitants and the great number of school-children who lined the streets, while she was greatly interested in the fleet of aeroplanes which escorted the special train during the latter part of the journey."

[One fails to understand all this fuss about Princess Mary's escort. There seems no good reason why young pilots who are not yet fit for active service should not have the honour of escorting the Princess.—Ed.]

THE FUTURE OF THE ROYAL FLYING CORPS.

SOME POSSIBILITIES.—II.

BY "BERKELEY."

REGIMENTAL LOYALTY.

In the early days of the Royal Flying Corps when officers were posted to the unit because of their skill as pilots and when such few as did not need to act as pilots by reason of their rank and appointment invariably underwent such preliminary training in aviation as would qualify them for the Royal Aero Club's aviator's certificate, there was but little permanency in the officer personnel. In other units of the Army, officers who joined from Sandhurst or Woolwich did so in the majority of cases with the intention of spending the greater part of their professional career in their chosen corps, interspersed though the period of service might be with a few years of work on the General Staff if it so chanced that their ability or inclination led in that direction. To an officer his regiment or corps was his home, to be ever regarded with that true affection that attaches to the things of splendid tradition. Only when promotion to the rank of general officer extended the area of their work did they leave the regiment in which their life, during its most impressionable period, had been spent.

With the Royal Flying Corps all was different. While officers were chosen because they were pilots, and while all such piloting was entrusted to officers, the period of individual service was limited by the continuance of the wish and the power to fly. Officers were seconded or attached for a period of four years because it was deemed that such would be the probable duration of a man's nerve under the strain of constant flying. No officers were posted to a permanent cadre. The majority came from other branches of the Regular Army, whilst a few were taken by direct entry from civil life and were given commissions in the Special Reserve of Officers. A few of this latter class were embodied for their entire period of service and the remainder came up for training during a part of each year.

CHANGING PERSONNEL.

Thus the Royal Flying Corps would, but for the intervention of the war, have been officered with a constantly changing personnel. The system had a few advantages. The officers selected were in most cases young and enthusiastic. Also it followed that when or if an officer tired of so strenuous a unit he could return to his regiment and continue his temporarily interrupted career without loss of seniority or prestige. On the other hand, there were the obvious disadvantages of lack of continuity and of the temptation to officers to regard their service in the Royal Flying Corps as merely a brilliant and exciting interlude in an otherwise well-ordered life.

If it be admitted that the work of piloting can be carried out adequately by N.C.Os. and rank and file, then the great difficulty in the way of posting officers permanently to the corps is removed. The officers required to lead in the air can be found with ease from the mass required to administer and maintain the Royal Flying Corps. When an officer ceases to care for flying, and the decay of such affection will become less and less in the future just as the child-horse of the present day no longer regards motor-cars with dislike tempered by fear, he would be employed in innumerable other ways without leaving his own branch of the Service. Equipment officers, adjutants and such like impedimenta could then be found within the corps and without the necessity of going humbly clothed into the highways and hedges and begging for candidates. Moreover, the Royal Flying Corps would become a career instead of an interlude in a life.

There is little question that the Royal Flying Corps, unless, indeed, it be merged in the great single Air Service, so beloved of the politician out of office, will, when the war ceases, be reorganised in some manner similar to that suggested above. But with the renewal of peace it is unlikely that the previous methods of selection will obtain. The recruiting of the commissioned ranks by direct entry, a method which has been necessary if the Royal Flying Corps were to continue to exist at all, can hardly continue in later days. It is in itself a reversion to a system which was abandoned in the early days of the nineteenth century when the necessity of the higher training of officers became apparent. Professional training is not likely to become less necessary in the future!

A THIRD ACADEMY.

It is equally unlikely that any system of isolated Royal Flying Corps would be satisfactory—that some third academy similar in intention to those at Woolwich and Sandhurst could be founded with success. The scheme of training in being at the existing military colleges is directed towards the creation of such virtues of the officer caste as it is possible to inculcate by precept and example as well as to the giving of preliminary instruction in military science. It could only be of advantage to the Royal Flying Corps if that unit found its officers in exactly the same way as does the cavalry or the infantry. The two year course in a military college is a sufficiently firm foundation for a career in any branch of the King's Service. Cadets desiring to enter the Royal Flying Corps could pass into Woolwich—the cradle of the commissioned ranks in the scientific arms—as do those who propose to become gunners or sappers. On the conclusion of the necessary number of terms the cadet would be posted to a squadron of the Royal Flying Corps stationed at home where he would begin his special training into the mysteries of practical military aeronautics. When the R.F.C. has its own permanent cadre, service with a line battalion, which at one time appeared to be a desirable system to support, would be quite unnecessary, as there would be no difference in the spirit of the life in the Flying Service or in any other unit of the Army.

A REGULAR CADRE.

Once the system of appointment and the individual duration of service alters in the Royal Flying Corps its relation to the remainder of the Army changes fundamentally. At present officers, as has been shown above, are either seconded to the unit, are attached, or are borne in the Special Reserve. There is no regular cadre. Therefore, it is all in a sense special service, and any officer in the Royal Flying Corps desiring to be employed in any outside capacity, either with another unit or on the General Staff, would of necessity relinquish his connection with the Flying Service. There can only be loss in such a system. When officers are posted to a regular cadre of the Royal Flying Corps they will in due course, if they so desire, be eligible for entry to the Staff College, and can be seconded for service on the Staff or in any unit they may desire. The broadening of outlook consequent on such a change cannot but be of advantage.

The Limitations of the R.F.C.

Under present conditions, when an officer (direct entry) of the Royal Flying Corps reaches the rank from which he is eligible for promotion to general officer, he is little fitted by his training to take command of, say, an infantry brigade, and is, in fact, only suitable for a brigade in the Royal Flying Corps itself. This is a limitation which can only be passed by genius, and genius is very rare in a workaday world. The principle which has brought the British Army to its position of eminence is much more catholic in its scope. Sir Douglas Haig is a cavalry man, the Earl Roberts was an artillery man, and the Duke of Wellington passed his early days in the finest school of all—the infantry of the line. There are many reasons in favour of the Royal Flying Corps producing general officers of singular ability. The very nature of their warlike duties, if taken in the right way, gives the young officer a deep insight into the workings of the different arms of the Service throughout a campaign. There is no branch save the General Staff which is brought into such close contact with each of the great bodies of the Army in peace or in war. The artillery relies on the R.F.C. for observation, the cavalry is allied with it in observation, and its maps and information are essential to the infantry at all times. The reorganisation of the Royal Flying Corps that it may be similar in general outline to, for instance, the Royal Regiment of Artillery, would make it possible for these inherent advantages to be used in the production of leaders of armies from those who attained distinction in earlier life as leaders of flights or squadrons.

Temporary Attachment.

After the change it would also be possible for R.F.C. officers to be attached to other arms of the Service, that knowledge of other people's difficulties may be acquired. The system of allowing officers to serve for brief periods with units of a different category has never been developed as it might well have been. The higher command and countless Royal Commissions have recommended it, but like most things of use to the Army, public apathy in time of peace has prevented any adequate trial. Watching another man at his work rarely creates sympathy, but the necessity of assisting that man in his labours entirely alters all conditions.

The Special Reserve.

The Special Reserve of the Royal Flying Corps would alter but little. As in other units it would serve for draft finding in time of war. Many of the officers now in the Special Reserve would, no doubt, be transferred to the Regular Service at the end of the war, leaving the nucleus of a real reserve unit. A few weeks' service in each year would be sufficient to keep such officers in touch with the progress of aeronautics and the development of military science, and would also indicate the inefficiency of those others whose interest and keenness had disappeared. Those officers who, on retirement from the Regular branch of the Royal Flying Corps had remained on the Reserve of Officers might also, with advantage, be invited to share in a routine annual training, though officers of this class would be most useful on emergency in positions of administration and in the training of the newly joined officers.

The Making of Tradition.

But in whatever manner the change may come there is no question that it will come. It may be that all surmise is in vain and that a new single air Service will sweep the existing corps out of existence. It may be so, and there will be many who will regret it. One thing is, however, certain. Younger than any other of the great corps of the Army, it has in its brief career acquired such merit that its tale will never be forgotten while England exists. Those who have died that its tradition might live, and those who work to-day that its name may ever be clean and great, will reap their reward in the future gratitude of that body, of which it has proved itself a worthy unit, the British Army.

TIMBER FROM NORTH AMERICA.

It is announced by the Controller of Timber Supplies that the following relaxations of the restrictions on the import of timber from North America have been arranged:—

(1) Neutral Sailers.—Timber may be imported from Canada and the United States of America under the usual procedure as regards import licences.

(2) Deck Loads.—A general licence has been granted by the Department of Import Restrictions for the importation of timber as deck cargo from Canada and the United States of America. In this case it will not be necessary for importers to apply for licences.

(3) Prices.—The orders which limit the prices of imported softwood to those current during the last week of January, 1917, will not apply to timber imported from Canada and the United States after July 19th, 1917.

Timber so imported may be sold by the importers at its cost price, delivered to store, plus 10 per cent., provided that the price so calculated does not exceed by more than a third the price current during the last week of January, 1917, for softwood of similar quality and description in the same locality. It may be sold by persons other than the importers at prices which are in accord with the foregoing proviso.

AN ECCLESIASTICAL INSCRIPTION.

It is reported that the War Office has presented the Rector of South Hackney (the Rev. B. S. Batty) with a very fine section of the "Zeppelin" which was brought down at Cuffley. This has been placed in the west end of the nave of the church, and a printed inscription bears the following:—"Portion of the Zeppelin brought down at Cuffley, September, 1916, after voyaging over South Hackney. Presented by the War Office to South Hackney Parish Church. For the skill and courage of our airmen, we praise Thy Name, O Lord."

[The fact that people still insist upon installing the Almighty as patron of war shows that we are still many leagues away from real civilisation. The suggestion that Jehovah is to be praised for supplying one set of men with the skill and bravery necessary to overcome another set of men also endowed with skill and bravery, seems to indicate that our State religion is still that of the elemental Semitic tribes. And, anyhow, why thank Jehovah for a Zeppelin which was a Schütte-Lanz?—Ed.]

AN EDUCATIVE EFFORT.

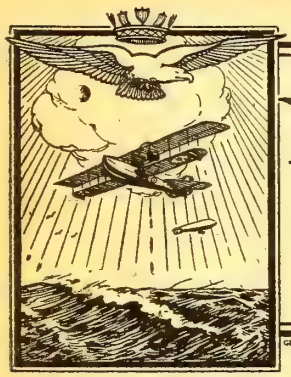
The War Office has arranged for distinguished Flying Corps officers to visit aeroplane factories and tell the workers something of the service which their machines are doing at the front. It is hoped that these informal lectures will link together the men and women of the factories with the men who use what they have made. Trade Union officials, shop stewards, and every class among the workers are alleged to be immensely interested. The lecturers have been impressed by the intelligence of their audiences and their keenness to know. The idea has already been mentioned in connection with the Aeronautical Society.

A DUBIOUS PRECAUTION.

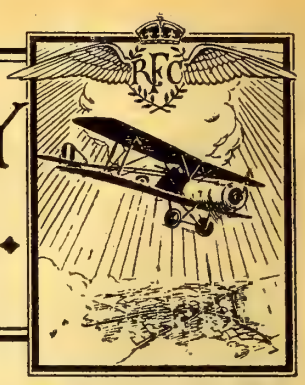
A Royal Proclamation published in the "London Gazette" for July 17th prohibits the exportation from the United Kingdom of drawings, designs, specifications, and other descriptions in writing of any kind of aeroplanes or other aircraft or of engines or other accessories of aircraft.

The order is good, in that it may prevent reckless circulation of our new ideas to Allied countries, whence, or en route to which, they might get into the hands of the enemy. But there is a serious objection in that it prevents free trade in designs between British and American designers, and leaves too much power in the hands of minor officials who may use it to their own advantage. Permission to send a new design abroad might be hampered by intrigue, and so prevent the improvement of American aircraft.

AEROPLANE CONSTRUCTION.



NAVAL and MILITARY AERONAUTICS



FROM THE "LONDON GAZETTE."

Admiralty, July 16th.

R.N.A.S.—Temp. Flt. Lt. to be temp. Flt. Comdr.:—L. A. Hervey, June 30th.

War Office, July 17th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing.—Flt. Comdrs.—From Flying Officers, and to be temp. Capts. while so empld.:—Sec. Lt. H. J. Butler, Spec. Res., June 20th. Temp. Lt. A. H. Peck, Gen. List, June 23rd. Sec. Lt. (temp. Lt.) W. E. Grosset, Cyclist Bn., T.F.; Sec. Lt. (temp. Lt.) H. E. Read, Yeo., T.F., July 3rd. From Flying Officers.—Capt. C. T. Holmes, R. War. R., Spec. Res., July 1st. Lt. J. L. Vachell, R.F.A., T.F., and to be temp. Capt. while so empld., July 5th.

* * *

The King has been pleased to approve of the award of the Military Cross to the following Officer:—

Capt. John Palethorpe, R.F.C.

During a recent hostile air raid Capt. Palethorpe, with 1st Cl. Air Mech. J. O. Jessop, R.F.C., as Gunner, was engaged in an endurance trial from a testing squadron.

When about three miles from the coast a formation of 17 enemy aeroplanes was sighted. Capt. Palethorpe at once attacked with great courage and determination, under very heavy fire, till the Gunner was killed.

He then landed, and having procured another Gunner, endeavoured to renew the attack.

* * *

Mentioned in Dispatches for gallant and distinguished services in connection with recent enemy air raids:—

No. 25501 1st Cl. Air Mec. James Oliver Jessop, R.F.C. (killed in action).

War Office, July 18th.

The King has been pleased to award a second Bar to the Distinguished Service Order to:—

Capt. Charles Edgar Bryant, D.S.O., Lrs. and R.F.C.

He has displayed the utmost gallantry and skill in leading photographic reconnaissances. In spite of overwhelming opposition by hostile aircraft, he has never failed to carry out his difficult task. (D.S.O. gazetted Feb. 18th, 1915.)

* * *

The King has been pleased to approve of the appointments of the following Officers to be Companions of the Distinguished Service Order in recognition of their gallantry and devotion to duty in the field:—

Lt. (temp. Maj.) Leonard Wright Learmount, M.C., Gen. List and R.F.C., Spec. Res.

He has shown great skill and determination when on photographic reconnaissances. Despite continuous fire from the ground and attack from hostile aircraft, he has repeatedly effected a safe landing after completing his task.

Temp. Lt. (temp. Capt.) Charles Frederick Algernon Portal, M.C., Spec. Res., and R.F.C.

For many months he has done magnificent work in co-operation with the artillery. During an attack he succeeded in silencing nine active hostile batteries, ranging our artillery. His splendid example has been of the greatest value.

* * *

The King has been pleased to award a Bar to the Military Cross to the following Officers:—

Temp. Sec. Lt. William George Barker, M.C., Gen. List and R.F.C.

He has done continuous good work in co-operation with the artillery, and has carried out successful reconnaissances under most difficult and dangerous conditions. (M.C. gazetted Jan. 10th, 1917.)

Capt. Francis Richard Cubbon, M.C., Ind. A, attd. R.F.C.

When acting as an observer on an offensive patrol, he displayed great skill and courage against superior numbers of the enemy. Throughout the action he backed up his pilot with a remarkable display of marksmanship. (M.C. gazetted in this "Gazette.")

Lt. (temp. Capt.) Frederick James Harry Thayre, M.C., R.F.C., Spec. Res.

When in command of an offensive patrol he showed fine leadership and skill, being personally responsible for bringing down three hostile machines. His coolness and courage enabled his small command to inflict severe losses on numerically superior forces. (M.C. gazetted in "London Gazette" of July 18th.)

* * *

The King has been pleased to confer the Military Cross on the following Officers in recognition of their gallantry and devotion to duty in the field:—

Lt. James Dacres Belgrave, Oxf. and Bucks L.I. and R.F.C.

On at least five occasions he successfully engaged and shot down hostile aeroplanes, and has consistently shown great courage and determination to get to the closest range; an invaluable example in a fighting squadron.

Sec. Lt. Maurice Arthur Benjamin, R.F.C, Spec. Res.

He helped to attack two large hostile machines, one of which was seen to crash to the ground. Previously he helped to engage three hostile scouts, one of which was destroyed and the remainder dispersed. He has helped to destroy four hostile machines in all.

Sec. Lt. Edwin Leslie Bishop, Worc. R., Spec. Res., attd R.F.C.

When engaged with another pilot in taking important photographs, they were attacked by a superior number of hostile machines. The other pilot was forced to land, and he himself was driven down close to the ground; but, despite the presence of the hostile machines, he climbed once more and succeeded in taking a large number of most valuable photographs.

Sec. Lt. Charles Edward Blayney, R.F.C., Spec. Res.

For conspicuous gallantry and skill on many occasions in successfully bombing stations and trains at very low altitudes. He has at all times displayed the greatest bravery and skill.

Capt. Cyril Marconi Crowe, R.F.C., Spec. Res.

For conspicuous gallantry and skill as a leader of offensive patrols, many times attacking hostile formations single-handed, and descending to low altitudes under heavy anti-aircraft fire. He has been responsible for the destruction of several enemy machines.

Capt. Francis Richard Cubbon, I.A., attd. R.F.C.

He has shown great pluck and determination when acting as observer, on several occasions displaying fine marksmanship and coolness against superior numbers of the enemy.

Temp. Capt. Harold Fowler, Gen. List and R.F.C.

He has done invaluable service in co-operating with the artillery. On one occasion he descended to 300 ft. and turned our guns on to parties of hostile troops. During the advance he was able to furnish much valuable information.

Temp. Sec. Lt. Cecil Stuart Goodfellow, Gen. List and R.F.C.

He has done valuable and consistent good work in co-operating with the artillery. He has carried out numerous patrol flights under most adverse weather conditions, and has set a splendid example to his squadron throughout.

Lt. (temp. Capt.) Lionel Thomas Nutcombe Gould, R.A. and R.F.C.

He has done consistent, good, and valuable work while co-operating with the artillery, often under most difficult conditions. He always set a splendid example by his exceptional pluck and determination.

Temp. Sec. Lt. (temp. Capt.) John Benjamin Graham, Gen. List and R.F.C.

He has displayed great skill and courage when leading photographic reconnaissances. On many occasions, although attacked by superior numbers, he, by his courage and determination, has succeeded in completing his reconnaissances.

Temp. Sec. Lt. (temp. Capt.) Robert Gregory, Conn. R., Spec. Res., attd. R.F.C.

On many occasions he has, at various altitudes, attacked and destroyed or driven down hostile machines, and has invariably displayed the highest courage and skill.

Temp. Sec. Lt. William Henry Gunner, Gen. List and R.F.C.

While on offensive patrol he engaged and attacked nine hostile aircraft, two of which were attacking the rear machine of his patrol. Having convoyed the other machine back to the aerodrome, he again returned with his patrol in response to an urgent call for aeroplanes to drive off hostile aircraft. He had been wounded in his previous encounter, but insisted on carrying on, and on numerous other occasions he has shown great skill and courage in offensive work.

Sec. Lt. Reginald Theodore Carlos Hoidge, R.G.A., Spec. Res. and R.F.C.

On many occasions he has attacked and destroyed or driven down hostile machines, and has taken part in 24 offensive patrols. In all combats his bravery and skill have been most marked.

Temp. Lt. Richard Neville Kenward Jones, Gen. List and R.F.C.

He has done consistent good work in the taking of photographs under very adverse weather conditions. By his perseverance and determination he has set a very high standard of efficiency in the photographic work of his squadron.

Sec. Lt. Arthur Gordon Jones-Williams, Welsh R. and R.F.C.

He has continuously shown the utmost dash and gallantry in attacking superior numbers of hostile machines. On one occasion he attacked 12 hostile scouts and succeeded in destroying one and driving down another.

Sec. Lt. Douglas Stewart Kennedy, R.F.C., Spec. Res.

While on a close patrol he attacked three hostile scouts and succeeded in dispersing them. A second formation of four enemy machines then attacked, but these were also dispersed, two of them being driven down. The result of these combats was largely due to his skill and determination.

Temp. Sec. Lt. Reginald George Malcolm, Gen. List and R.F.C.

He has shown exceptional skill and courage in aerial fighting. He has several times been attacked by superior numbers, and on each occasion has accounted for more than one of the hostile machines and effected a safe landing himself.

Temp. Capt. Eyde Rolleston Manning, Gen. List and R.F.C.

For conspicuous gallantry and devotion to duty when conducting photographic reconnaissances. On one occasion he obtained successful photographs though attacked by eight hostile machines, and he has on all occasions displayed the utmost pluck and gallantry.

Sec. Lt. (temp. Capt.) Kenneth Campbell McCallum, Arg. and Suth'd Highrs., Spec. Res., and R.F.C.

When engaged in escorting a formation of bombing machines he attacked four hostile aircraft, bringing down two of them. While fighting these he was attacked by a large hostile formation, which completely surrounded him. Although badly wounded in the foot he succeeded in effecting a safe landing behind our own lines.

Sec. Lt. Lewis Laugharne Morgan, Welsh R., attd. R.F.C.

He crossed the lines at a height of under 100 ft. and destroyed a hostile kite balloon. Previously he attacked a hostile scout at close range, and brought it down in flames. He has shown great gallantry in many combats.

Lt. Charles Allen Parker, R.F.A., Spec. Res., and R.F.C.

When on a photographic reconnaissance he was attacked by hostile scouts, and his observer was severely wounded. He effected a landing near our front line, and carried his observer clear of the machine, which was heavily shelled the entire time, and had burst into flames.

Sec. Lt. (temp. Capt.) Leslie Hurst Peter, R.E. and R.F.C.

When leading a reconnaissance his formation was attacked by hostile scouts. He kept his machines together and carried out a successful photographic reconnaissance despite a strong attack. To his leadership and initiative were largely due the success of the patrol.

Temp. Sec. Lt. William Thomas Price, R. War. R. and R.F.C.

His machine being disabled by hostile fire, and his gun out of action, he managed by skilful handling to effect a safe landing, thus saving the machine and his passenger from capture. He has previously done fine work against hostile aircraft.

Sec. Lt. Arthur Percival Foley Rhys-Davids, R.F.C., Spec. Res.

On many occasions he has shot down hostile machines and put others out of action, frequently pursuing to low altitudes. On all occasions his fearlessness and dash have been most marked.

Lt. (temp. Capt.) Edward Arthur Beckton Rice, R.F.C., Spec. Res.

For conspicuous gallantry and devotion to duty when leading photographic reconnaissances. Though repeatedly attacked, he led the formation to its objective on every occasion with the utmost skill and determination, and has set a very fine example of leadership in no less than 11 successful operations.

Sec. Lt. Alfred Scott, R.F.A. and R.F.C.

For conspicuous gallantry and devotion to duty in personally laying a telephone wire under machine-gun fire after his two telephonists had been wounded. He afterwards returned under heavy fire to the wounded men, got them under cover, and dressed their wounds.

Temp. Sec. Lt. (temp. Capt.) John Kenneth Summers, Gen. List and R.F.C.

He had continuously performed valuable work in co-operating with the artillery. He has on many occasions flown at a very low altitude in order to give information to the infantry, which has proved of the utmost value.

Lt. (temp. Capt.) Frederick James Harry Thayre, R.F.C., Spec. Res.

He has consistently displayed great dash and skill and determination when acting as a pilot in bombing raids. His fine offensive spirit and determination to close with the enemy has set a splendid example to his squadron.

Temp. Capt. Anthony Herbert William Wall, Midd'x R. and R.F.C.

As an observer he has on several occasions assisted to bring down hostile machines. His coolness and accurate shooting have helped very largely in aerial combats.

Temp. Sec. Lt. Edmond Percy Wilmot, Gen. List and R.F.C.

For conspicuous gallantry and devotion to duty whilst co-operating with artillery. On one occasion he successfully ranged a siege battery on an enemy gun position in very bad weather, which necessitated flying at a very low altitude, during which he was subjected to an intense fire.

AUSTRALIAN IMPERIAL FORCE.—Sec. Lt. (temp. Capt.) Wilfred Ashton McCloughry, Aus. L. Horse, attd. R.F.C.

On many occasions he has displayed the highest courage and skill in successfully bombing stations and trains, often at very low altitudes, and has always given a fine example of energy and determination.

CANADIAN FORCE.—Capt. Joseph Achille le Royer, Can. Infy. and R.F.C.

He has constantly shown great skill and courage when acting as observer. His accurate shooting and coolness under fire have largely contributed to his successful aerial combats against superior numbers.

* * *

His Majesty the King has been pleased to award the Military Medal for bravery in the field to the following Non-Commissioned Officer and Men :—

12867 2nd Cl. Air Mech. A. J. Acock, R.F.C.
6509 1st Cl. Air Mech. G. A. Beardmore, R.F.C.
44350 2nd Cl. Air Mech. F. C. King, R.F.C.
50120 2nd Cl. Air Mech. H. Potter, R.F.C.
9566 Cpl. F. H. Squire, R.F.C.
13554 1st Cl. Air Mech. R. H. Thomas, R.F.C.
5075 1st Cl. Air Mech. J. D. Wynne, R.F.C., attd. R.F.A.

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WAR OFFICE, July 18th.

The Secretary of State for War has received a dispatch dated Salonika, March 29th, 1917, from Lieutenant-General G. F. Milne, C.B., D.S.O., Commanding in Chief, British Salonika Force.

The following mention " for distinguished services during the past six months " is made of officers and men of the Flying Services :—

ROYAL NAVAL AIR SERVICE.

Smyth-Pigott, Lt. (actg. Squad. Comdr.) J. R. W., D.S.O.

ROYAL FLYING CORPS.

Dawes, Maj. (temp. Lt.-Col.) G. W. P., D.S.O., R. Berks. R.; Cleghorn, Lt. (temp. Maj.) A., R.E.; Wise, Lt. (temp. Capt.) C. W., A.S.C., Spec. Res.; Gardner, Lt. (temp. Capt.) G. D., York. R.; Birch, Sec. Lt. (temp. Capt.) W. L., W. York R.; Nevill, Sec. Lt. (temp. Capt.) S. S., Spec. Res.; Scott, Lt. W. S., M.C., Lan. Fus.; Saunders, temp. Lt. F. G., Gen. List; Wilson, temp. Lt., J. R., R. E.; Leigh, Sec. Lt. (temp. Lt.) J. W. D., Cyc. Bn.; Scholtz, Sec. Lt. H., R.F.A., Spec. Res.; Broadway, Sec. Lt. J. H., Dorset R.; Bamford, temp. Sec. Lt., J. L., Gen. List.

Tansley, No. 740 Flt. Sgt. R. J. C. (decd.); Alcock, No. 2832 Sgt. A.; Yates, No. 2454 Cpl. T. M.; Wood, No. 28309 1st Cl. Air Mech. W. T.; Ledger, No. 8073 1st Cl. Air Mech. W. H.; Parkhurst, No. 3745 1st Cl. Air Mech. W. E.; Wolfe, No. 2372 1st Cl. Air Mech. W.

War Office, July 19th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing.—Special Appt.—(Graded as a Park Comdr.).—Capt. (temp. Maj.) the Hon. F. A. Stonor, R.F.C., Spec. Res., from an Equipment Officer, 1st Cl., and to retain his temp. rank while so employed, April 4th. (Substituted for the notification in the "Gazette" of April 17th).

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War Office, July 20th.

Memorandum.—Brevet Colonel (temporary Brigadier-General) W. S. Brancker, R.A., to be temporary Major-General whilst employed as Deputy Director-General of Military Aeronautics, June 22nd, 1917.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing.—Sqdn. Comdrs.—Lt. (temp. Capt.) S. H. B. Harris, Spec. Res., from a Flt. Comdr. and from a Group Instr. in Gunnery (graded as Flt. Comdr.), and to be temp. Maj. whilst so empld., Feb. 17th. From Flt. Comdrs. and to be temp. Majs. whilst so empld. :—Lt. (temp. Capt.) R. T. Leather, Yeo., T.F., Feb. 20th. Capt. M. McB. Bell-Irving, D.S.O., M.C., Spec. Res., April 7th.. Maj. A. S. W. Dore, Worc. R., T.F., from a Flt. Comdr., May 7th. From Flt. Comdrs. and to be temp. Majs. whilst so empld. :—Lt. (temp. Capt.) A. M. Wilkinson, D.S.O., Hamps. R., T.F., May 10th. Capt. A. B. Adams, Spec. Res., June 20th. Capt. C. W. Anstey, S. Wales Bord., June 28th.

Flt. Comdrs.—From Flying Officers and to be temp. Capts. whilst so empld. :—Sec. Lt. B. A. Peck, R.F.A., Spec. Res.; temp. Sec. Lt. G. A. Maclean, Gen. List, June 1st. Temp. Capt. R. F. Stapleton-Cotton, Gen. List, from a Flying Officer, June 16th. From Flying Officers and to be temp. Capts. whilst so empld. :—Lt. G. D. F. Keddie, Lond. R., T.F.; temp. Lt. G. K. Palmer, Gen. List; Sec. Lt. J. S. Shaw, Spec. Res., July 1st. Sec. Lt. G. L. Lloyd, Yeo., T.F., July 6th. Temp. Lt. A. Roulstone, Gen. List; temp. Sec. Lt. A. Bell-Irving, Gen. List, July 7th. Sec. Lt. H. H. McL. Fraser, Spec. Res.; Sec. Lt. G. H. Hooper, R.E., T.F., July 9th.

Group Instrs. in Gunnery (graded as Flt. Comdrs.).—Capt. J. H. C. Minchin, Sco. Rif., a Flt. Comdr., from a Wing Instr. in Gunnery (graded as a Flt. Comdr.), vice Sec. Lt. (temp. Capt.) W. G. B. McKechnie, R. Sc. Fus., who reverts to Flying Officer and temp. Lt., Jan. 17th (substituted for notification in "Gazette" of March 13th). From Wing Instrs. in Gunnery (graded as Flt. Comdrs.).—Sec. Lt. (temp. Capt.) M. R. N. Jennings, Spec. Res., and to retain his temp. rank whilst so empld., vice Sec. Lt. (temp. Capt.) R. G. Heyn, Spec. Res.; temp. Capt. C. O. F. Modin, D.S.O., Gen. List; vice Capt. D. E. Ward, Lond. R., T.F., June 5th. Sec. Lt. (temp. Capt.) A. P. Hartley, Ches. R., T.F., from a Wing Instr. in Gunnery, graded as an Equipment Officer, 1st Cl.), and to retain his temp. rank whilst so empld., vice Capt. J. H. C. Minchin, Sco. Rif., who reverts to Flt. Comdr., June 30th.

Wing Instr. in Gunnery (graded as a Flt. Comdr.).—Sec. Lt. (temp. Lt.) R. C. Hardie, D. of Corn. L.I., Spec. Res., a Flying Officer, and to be temp. Capt. whilst so empld., vice temp. Capt S. E. Adams, Gen. List, who reverts to a Flying Officer and the rank of temp. Sec. Lt., March 15th.

Instrs. in Gunnery (graded as Equipment Officers, 1st Cl.).—Temp. Capt. C. B. Tidmarsh, Gen. List, a Flying Officer; Capt. H. E. F. Wyncoll, Notts and Derby R., from a Group Gunnery and Armament Inspr., March 22nd. And to be temp. Capts. whilst so empld. :—Sec. Lt. G. H. Higginson, N. Lan. R., T.F., and to be secd., vice temp. Capt. W. H. Miles, Gen. List, April 18th. Temp. Lt. J. D. Hodgson, Ches. R., and to be transfd. to Gen. List, May 1st. Temp. Sec. Lt. (on prob.) W. M. Groom, Gen. List, and to be confirmed in his rank, May 16th. Temp. Lt. C. C. Watts, K.R. Rif. C., and to be transfd to Gen. List; temp. Sec. Lt. B. Elliott, Gen. List, May 23rd. Temp. Sec. Lt. A. Haywood, R. War. R., and to be transfd. to Gen. List; Sec. Lt. (on prob.) G. F. P. Warren, Spec. Res., June 1st. Temp. Maj. G. P. Myers, Mach. Gun Corps; Capt. A. M. Lester, Lond. R., T.F., from a Cyclist Corps; Capt. D. E. Ward, Lond. R., T.F., from a Group Instr. in Gunnery (graded as an Equipment Officer, 1st Cl.), June 5th. From Instrs. (graded as Equipment Officers, 1st Cl.), School of Aerial Gunnery :—Temp. Capt. F. G. Wilson, Gen. List; temp. Sec. Lt. (temp. Capt.) S. W. Cooper, Gen. List, and to retain his temp. rank whilst so empld., June 5th. From Wing Instrs. in Gunnery (graded as Flt. Comdrs.) :—Temp. Capt. S. H. Bird, Gen. List; temp. Capt. H. E. Dixon, Gen. List; Sec. Lt. (temp. Capt.) A. P. Davidson, High. L.I.; Sec. Lt. (temp. Capt.) H. J. Brewster, Midd'x R.; Sec. Lt. (temp. Capt.) C. H. Stokes, Spec. Res.; Sec. Lt. (temp. Capt.) A. P. Hartley, Ches. R., T.F.; temp. Sec. Lt. (temp. Capt.) P. A. Moodie, Gen. List; Sec. Lt. (temp. Capt.) R. C. Hardie, D. of Corn. L.I., Spec. Res., June 5th; and to be temp. Capts. whilst so empld. :—Lt. F. R. Alford, M.C., Canadian Inf., from an Asst. Instr. (graded as an Equipment Officer, 2nd Cl), School of Aerial Gunnery; Sec. Lt. (temp. Lt.) D. H. S. Davies, R. War. R., a Flying Officer; temp. Sec. Lt. R. C. Boddie, Gen. List, an Equipment Officer, 3rd Cl., June 5th. Temp. Lt. L. J. Gulliver-Cradwick, Essex R., vice temp. Sec. Lt. (temp. Capt.) P. A. Moodie, Gen. List, who reverts to Flying Officer, and relinquishes the rank of temp. Capt.; temp. Lt. H. F. Alton, Gen. List, from an Asst. Instr. (graded as an Equipment Officer, 2nd Cl.), vice Sec. Lt. (temp. Capt.) C. H. Stokes, Spec. Res., who reverts to Flying Officer, and the rank of Sec. Lt.; temp. Sec. Lt. L. P. Hoult, Gen. List, from an Asst. Instr. in Gunnery (graded as an Equipment Officer, 3rd Cl.); Sec. Lt. (on prob.) (temp. Lt.) L. A. Price, Spec. Res., from an Asst. Instr. in Gunnery (graded as an Equipment Officer, 2nd Cl.), vice temp. Capt. H. E. Dixon, Gen. List, who reverts to Flying Officer, June 30th. Temp. Sec. Lt. (temp. Lt.) J. H. Gaudion, Gen. List, from an Asst. Instr. (graded as an Equipment Officer, 2nd Cl.), School of Aerial Gunnery, July 13th.

Adjt.—Lt. (temp. Capt.) W. O. Raikes, E. Kent R., Spec. Res., from a Flying Officer, and to retain his temp. rank, but without the pay and allowances of that rank, April 17th.

Equipment Officers, 1st Cl.—From the 2nd Cl., and to be temp. Capts. whilst so empld. :—Lt. G. L. Main, Spec. Res.; Sec. Lt. (temp. Lt.) H. W. Mills, Spec. Res.; Sec. Lt. (temp. Lt.) J. J. Botterill, Spec. Res., June 1st. Capt. E. D. Dent, R. Dub. Fus., Spec. Res., from a Flying Officer; Sec. Lt. (temp. Lt.) L. R. Kerridge, Spec. Res., from the 2nd Cl., and to be temp. Capt. whilst so empld., July 2nd. 2nd Cl.—From the 3rd Cl. :—Sec. Lt. (temp. Capt.) A. Sowden, W. York R., T.F. And to be temp. Lts. whilst so empld. :—Temp. Sec. Lt. E. H. Hooper, Gen. List; Sec. Lt. L. Davies, Spec. Res.; Sec. Lt. H. C. S. Bullock, June 1st. Sec. Lt. (temp. Capt.) C. Higham, Manch. R., T.F., June 12th. Sec. Lt. R. A. W. Collet, Spec. Res., and to be temp. Lt. whilst so empld., June 14th. 3rd Cl.—Lt. J. S. D. Harvies-Jones, Spec. Res., reverts from the 2nd Cl., July 4th.

Schools of Instrn.—School of Aerial Gunnery.—Comdt.—(Graded as a Flt. Comdr.).—Lt. (temp. Capt.) A. G. H. Carr, York and Lanc. R., T.F., from a Wing Instr. in Gunnery (graded as a Flt. Comdr.), and to retain his temp. rank while so empld., April 24th.

Chief Instr.—(Graded as a Flt. Comdr.).—Temp. Capt. A. R. C. Cooper, Gen. List, from a Wing Instr. in Gunnery (graded as a Flt. Comdr.), May 8th.

Instr.—(Graded as a Flt. Comdr.).—Sec. Lt. (temp. Capt. R. G. Heyn, Spec. Res., from a Group Instr. in Gunnery (graded as a Flt. Comdr.), and to retain his temp. rank while so empld., vice temp. Capt. F. G. Wilson, Gen. List, June 5th.

Admiralty, July 20th.

The King has been pleased to give orders for the following appointments to the Distinguished Service Order :—

Wing Capt. Edward Maitland Maitland, R.N.A.S.

In recognition of valuable and gallant work in connection with airships and parachutes. He has carried out experiments at his own personal risk, and has made some descents under enemy fire.

Sqdn. Comdr. Charles Henry Butler, D.S.C., R.N.A.S.

In recognition of his gallantry on June 5th, 1917, when he fought single-handed two engagements with a number of powerful hostile machines. He attacked six hostile aeroplanes together over the Thames Estuary, and later attacked two off Ostend. On each occasion the machine selected for attack was compelled to dive.

Flt. Lt. Basil Deacon Hobbs, D.S.C., R.N.A.S.

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The King has been pleased to approve of the award of the Distinguished Service Cross to the following Officers :—

Lt. John Jenkins, R.N.R.

For services in command of a seaplane-carrying vessel, on the East Indies and Egypt Station, during the period April 1st, 1916-March 31st, 1917.

Lt. John Kerr, R.N.R.

For services in command of a seaplane-carrying vessel on the East Indies and Egypt Station during the period April 1st, 1916-March 31st, 1917.

Sub-Lt. (Act. Lt.) Henry Beattie Bell-Irving, R.N.V.R.

In recognition of his services in command of H.M. Drifter I.F.S., in an engagement with five enemy seaplanes on June 11th, 1917. Two of the enemy machines were brought down by gun-fire, and destroyed.

Flt. Comdr. John Callaghan Brooke, R.N.A.S.

In recognition of his services in the East Indies and Egypt Seaplane Squadron during the period April 1st, 1916-March 31st, 1917. During this time he took part in several valuable reconnaissances and bombing flights, obtaining important information and doing considerable damage to enemy organisations.

Flt. Comdr. Thomas Francis Netterville Gerrard, R.N.A.S.

In recognition of his services during an air fight on June 4th, 1917. This officer led his flight against 15-20 hostile aeroplanes, and alone had 10 engagements with these machines. He at-

(*Continued on page 255.*)

AERONAUTICAL ENGINEERING

SUPPLEMENT TO "THE AEROPLANE"

INCORPORATING AIRCRAFT ENGINEERING, AERODYNAMICS, AND MATTERS PERTAINING TO THE AERONAUTICAL ENGINEER AND THE AIRCRAFT TRADER

The Production of Aeroplanes and their Components

(Seventh Instalment.)

BY STEPNEY BLAKENEY.

A Plane Erecting Jig.

Having considered the manufacture of all the parts required to construct the centre plane, the next thing will be to erect it. A completed Centre Plane Section is shown in Fig. 13. As very considerable accuracy and squareness is required, it will be necessary to do this work also in a jig, as these centre sections must be absolutely interchangeable with each other, and square. Therefore, a small jig-table must be prepared in a manner similar to the fuselage jig-tables.

On this set out a centre line lengthways of the table, and on this line, at right-angles to it, set out the centre line of the compression spars. Then carefully with a gauge mark the centre line on the ends of each spar when it is standing on one of its narrow sides. Lay the spar on the jig-board and see that the centre lines on the spar and jig-board coincide exactly. Then clamp them down, and screw hard wood stops on each side to keep them there, taking care not to put the stops in the way of ribs. Also fix end stops to locate the compression spars in the centre. Then very carefully check the measurements in between after having completed the stops for holding the spars.

The next thing to do is to glue and screw four pieces of packing under them, namely, two near each end to raise them up off the jig about ¼ in. This is necessary to enable the bottom flange of the rib to slide into its position on the spar. To prevent the ribs from being pushed on too far, or being out of parallel with the centre line, limit stops must be fixed, so that the ribs can only be pushed onto the spars a definite distance, with absolute accuracy. Turn-buttons with a fairly long sweep must be fixed to keep the outside ribs up to this position.

Having done this, the next thing to do will be accurately to locate the three light centre ribs, and fix stops each side of them to hold them in position on the spars, for fixing. If all these things are done it will be impossible to build the centre plane incorrectly, provided the stops have been accurately placed in position, and the ribs and spars made correctly.

All that now remains is to get the jig passed by the inspection department, and assembling can then be commenced.

Assembling.

The first thing to do is to mark off the bolt holes on the spars for the wiring plates and strut eyebolts and get them drilled. This being done, slide on the three light centre ribs, then bolt on the wiring plates to the spars, and attached the swaged wires to them, at one end only; then slide on the compression end ribs.

Then place the whole over the jig and adjust each component part and drop the lot into their respective positions in the jig. Screw each in position, and give a touch of glue to each one, then leave the whole to set.

When the glue is set the centre plane can be taken out, the leading and trailing edges fitted, the bracing wires coupled up, the tension adjusted, and the whole plane finished and sand-papered off, ready for covering with fabric, with the exception of fixing the four eyebolts for attaching the plane to the vertical centre plane struts.

Bottom Main Planes.

The construction of the bottom main planes must now be considered, and the first thing that has to be done is to produce the front and rear spars, which we will assume to be 19 ft. 9 in. and 19 ft. 3 in. long, respectively, by 3½ in. by 2 in., tapered at the outer ends and lightened in the web where possible to H or girder section.

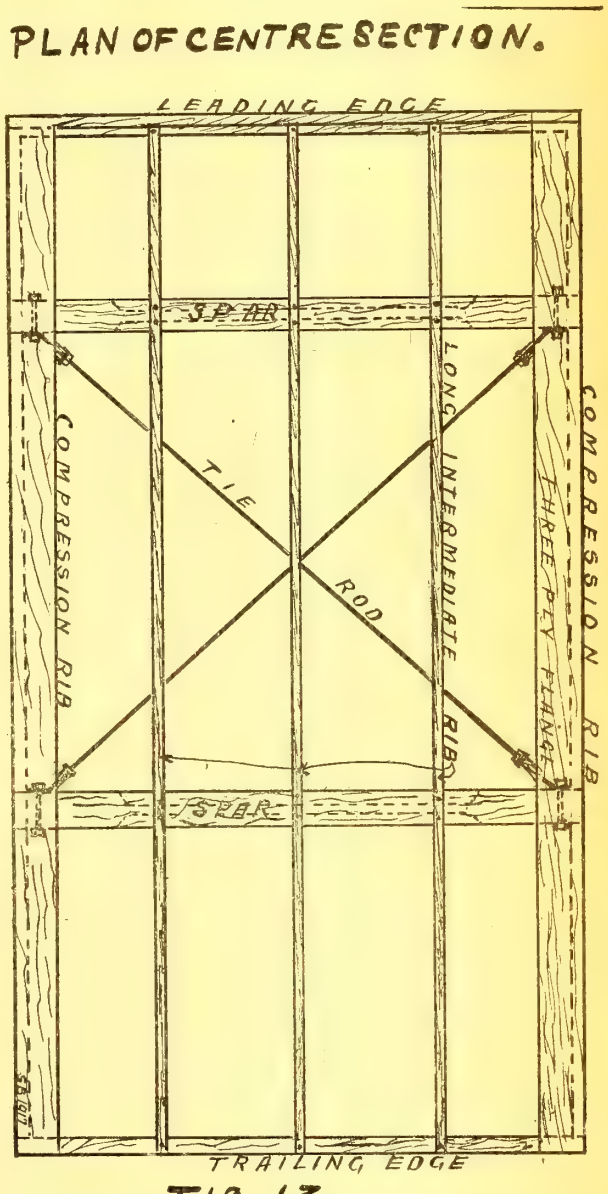


FIG. 13.

First-class spruce must be selected, and the timber cut so that a vertical grain is obtained when the spars are finished and lying in their natural position. They must have no short or twisted grain and must be free from any faults such as

"feathers" in the grain, sap, dead wood, shakes, splits, knots, or pockets of resin, however small.

As the A.I.D. may be relied upon to give these a severe testing and a rigid inspection, it is not advisable to cut up faulty timber and work it up in the hope of getting it passed.

Having selected the timber, it will be marked off, and taken to the circular-saw and sawn into the required rectangular section and length plus about 9 in. for cutting and finishing off ends.

LIGHTENING IN SPARS.

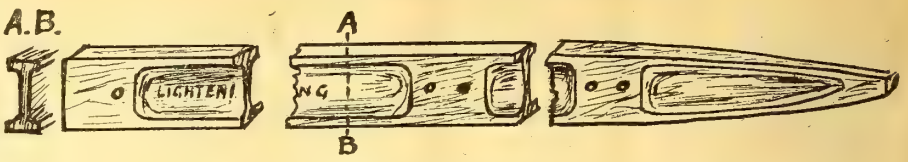


FIG. 14.

These sides will be planed and the edges shot; they will then be sent to the setter-out, who will set out the lightenings on a template of the length and width of the spar, but ½ in. or ⅝ in. thick, preferably of hard wood. The outer end will be tapered to suit the diminishing depth required in finishing off the tip of the wing where it cuts the leading edge.

Machining Out.

The lightenings having been marked off on the actual spar, a template or section of the finished spar, where the lightenings occur, should be made and sent in to the mill to the spindle hand, who will prepare the cutters, and spindle out a short length of spar to test the dimensions of the cut. This being correct, the spars may be lightened out as far as the straight portions go.

After which the spar template must be placed on the spar and the curved portion carefully marked off. Then the spar must be sent to the band-saw to have this portion cut to the curve, and it can then be finished off on the spindle or bench, as may be more convenient, or sent to the wood-finishers' benches.

It will then be ready for the spindling out of the lightening to be completed, as in Fig. 14.

Bevelling Off.

The last operations to be done to complete the spars for use will be to bevel the edges slightly right across to fit the contour of the ribs. As this bevel will be a definite angle and will probably be specified in degrees and half degrees, a level protector will be required to set out and check this operation. Careful reference to the plan should be made to ascertain the amount of bevel required. This work may either be done on the planing machine or the spindle.

A Delicate Operation.

The bolt holes for the wiring plates must now be marked off, also the holes for the strut eyebolts, which go vertically through the spars.

Before drilling these bolt holes it is necessary to point out to all concerned that the importance of these holes being drilled perfectly cannot be over-estimated, and, unfortunately, there are many who, being new to aircraft work, get an idea that the works' manager, foreman or inspectors, who point this out, do so either for the sake of talking or of showing their authority. This is not so. The holes must be drilled out in one dead straight line, and not started from each end, and allowed to meet "somewhere" in the middle, and as is done occasionally, an old bolt being driven through to clear the hole. This sort of work is not wanted, neither are "rat holes."

The holes must be accurately bored or drilled with a sharp cutting tool, exactly where they are required, and no limits are allowed for deviation, therefore it is advisable for all bolt holes to be bored by an accurately running sensitive drilling machine, bolted down to a firm foundation. Accurate work is rarely obtained from machinery attached to wooden floors in galleries, as is found in some works.

Finishing the Spar.

Having completed the holes, the last work to be done is to taper the end of the spar down to the point where it meets the leading edge, and this will be done by the wood-finishers' department, before going to the erecting shop. This being done, it can now be inspected and passed by the A.I.D.

Wing Section on Trestles.

The construction of the wings may now be considered, as the manufacture of ribs has been previously dealt with, and also the leading and trailing edges. For this work some light trestles, three in number, will have to be made, about 3 ft. high and 3 ft. 6 in. wide, of 1 in. boards, on edge, screwed to the floor with light iron knees and braced together with a light longitudinal bracing about 3½ in. by 1 in. Inclined bracing will connect the longitudinal bracing to the vertical leg of the middle trestle. The trestles being completed the erection of the wings can be commenced.

Take the spars and lay them in their correct positions on the trestles and mark off the positions of the various ribs, of which there will be about four different types. Commencing from the root of the wing and working outwards to the tips, we shall have the following: first, an extra strong rib with a solid web, then a number of ribs of a light design, with three-ply or lightened spruce webs, and then another rib with a solid web, where the joint occurs between the rib and the aileron.

After this, we have a number of ribs with the trailing end cut off where the rib flange reaches the rear side of the rear spar. The aileron makes up this portion, and is attached to the rear wing spar by about four hinges, which are attached to the wing spar and the aileron spar by bolts.

As each type of rib has a drawing number and part number, it will save a lot of confusion if the position of each rib on the spar has the drawing number and part number stamped on it with a rubber stamp, as this will enable any unskilled labour which may be employed in the erecting shop to place the right type of rib in the right place, and prevent mistakes and disputes.

Having marked off the positions of the ribs, the next thing to do is, make a list of the ribs required, and the number of each type required, and obtain these from the finished wood parts stores, and examine each one to see that it has been inspected and stamped by the A.I.D. It will be as well to keep the list of ribs for future use.

We can now thread the ribs carefully on the spars. In some cases we shall, no doubt, find that the spar holes in the webs of the ribs require easing. This can be done with some sandpaper wrapped round a stick.

The first ribs to be put in, will be the ribs in the centre of the wing. Then work outwards towards each end. Having threaded all the ribs on the spars the front spar should be clamped down to the trestles, and the mark of the rear spar end carefully squared off with the end of the front spar. These ends refer to the root of the wing, next to the fuselage.

This being done the ribs can be fixed to the spars by means of small brass screws. Each of the ribs should be tested with a square to make sure they are square with the spars.

Wiring Up.

The ribs being fixed, the wiring plates can be bolted in position and two or three bays of wire bracing put in, to keep the wing in shape.

It will be as well now to thread the stringers in position. These consist of long lengths of spruce about 5/16 in. square, which run parallel to the spars, and pass through the webs of each rib just under the rib flanges.

We can now turn our attention to the leading edge, which consists of spruce lightened out the shape shown in Fig. 12. This will be now threaded through the noses of the ribs, care being taken, after it is in position, to remember to see that all ribs remain square with the spars. As soon as this is done, the ribs can be screwed to the leading edge, and each side of the rib, then touched with glue.

Scarfing the Wing Tip.

The next thing to do will be to prepare the scarfed joint for the junction of the leading edge with the ash bend at the tip, this will be done by tapering the end off for about 7 in., after which the bend can be treated in the same way, carefully fitted and tried in position. Then the permanent joint with glue and ¾ in. by 6 in. gauge brass screws can be made. Two screws to each side should be sufficient, the whole being clamped up and left for about 10 hours. After that the scarfed joint can be shaped up and cleaned off, and left ready for binding with balloon cord.

The Trailing Edge.

The next thing to do is to fit the spruce trailing edge, and this will be done in the same way, but without any binding cord or similar joint. The strut to the end compression rib can now be fitted, also the small packing pieces between the ribs and riblets (small ribs), which are glued and tacked down.

Finishing Off.

When the whole lot is done, the next thing to do is to go over the whole skeleton wing and chisel off all sharp points and square corners and file off all projecting or rough screw-heads, tacks, and wood ends of riblets, etc., etc., and well sand-paper all over. After this, the wing may be considered ready for final trueing up and passing by the works' inspector, who, if he finds any faulty work, should see it rectified. Thereafter the wing is ready for passing by the A.I.D., for tapering and varnishing.

Then it will again be inspected by the A.I.D., and covering may be commenced.

COVERING.

The cover having previously been stitched up, and all seams carefully examined, and the cover being quite dry, it will be drawn onto the plane, starting from the leading edge and pulling across to the trailing edge, half the cover being on the lower side of the plane, and the other half on the top side. The fabric will then be carefully and evenly pulled taut, and tacked down temporarily, all seams being carefully straightened by pulling the fabric at each end. After this, all surplus fabric will be cut off and the two ends of the fabric sewn up, taking care to turn in the edges of the fabric, the joint being along the centre of the trailing edge, and, where the aileron gap occurs, along the top edge of the rear spar.

STRINGING.

Having neatly sewn up all the edges, the next operation is stringing the wing to keep the fabric tight to the ribs. This is done with a light, fine string, which is passed through the fabric from the top to the bottom round each rib about every four inches and knotted at each turn, taking care to knot up fairly tight.

This work, as well as the sewing, will be done by girls, and they do it well, after having a little tuition, but they always need a little supervision. One thing to be avoided is making holes with the stringing needle, where it is not intended a string should pass through, the only hole permissible being the one where the string passes through.

When this is done, the plane should be weighed to see that it does not exceed the standard weight for its type, and is then ready for its first coat of dope.

DOPING.

The plane having been brought into the dope room, one thing to do is to see that the specified temperature demanded of the room exists. The plane is then laid on bearers running longitudinally under the spars, and these will be supported on trestles. The dope then can be put into galvanised paint pots, for convenience. Special brushes will be required for doping, preferably about 4 in. wide. Common brushes for this work are useless, as the hairs come out and cover the plane, and spoil the finished appearance.

To start doping take a fair amount of dope on the brush, and work it first from leading edge to trailing edge, and then from left to right. Spread it evenly, taking care not to start too big a patch at once. In this manner cover the whole plane, after which the specified time must be allowed to elapse before proceeding.

STRIPPING.

The next thing to do is "stripping" the plane. This consists of again doping the line of stringing, and at once laying a strip of frayed tape over the stringing on to the wet dope and finishing off smooth with the brush. It is well also to cover the edges in a similar manner.

Allow the whole thing proper time to dry, according to the doping scheme employed. When dry, the whole should be doped again, until it has had about four or five coats. When this is done, the identification mark is set out, and the outer circle filled in with blue dope or colour, and then the red bull's eye. After this is done on the undersides of the lower planes, and has dried thoroughly, the wing can be varnished with the special varnish.

When this has set, the coat of pigment can be put on the top, and, finally, the last coat. The plane can then be left to dry, the whole of the doping process being complete.

In this manner ailerons, tail planes, and elevators will be doped. Other schemes are available, and may be worth trying.

AILERON CONSTRUCTION.

The construction of the ailerons can next be taken in hand, for the work of construction is very similar to wings. The difference is that the spar of an aileron is generally hollow, and made in two pieces, very carefully and well glued together.

The making of the hollow box spar requires very careful consideration, unless undertaken by experienced hands who are used to this class of work.

The timber selected requires to be of the best quality, and straight grained and dry, otherwise failure may reasonably be expected, and a considerable amount of time and material wasted.

The aileron spar we may assume to be about 4 ft. 9 in. long and 2½ in. deep and about 1¾ in. broad. They are made in halves, with about six lightenings in each half opposite each other. These will be cut out on the spindle.

These two parts form the spar, the lightenings being in the middle. The whole, when together, will taper down in the last third of its whole length to about one half of its normal sectional area, the ends of the spar, of course, being left solid.

In preparing these two halves to form the spar a considerable margin of timber should be allowed for cleaning up on the outside after spindling out the lightenings. Also, it is most essential that the halves of the spar, after coming from the spindle, should be placed in clamps to dry, as this timber, being freshly cut out, is likely to twist or warp and lose its shape if left to dry in a free state, together with the exposure to the air.

The halves of the spar having had a couple of days to dry, should now be brought to the wood-finishers' benches, where the joint faces will have to be carefully tried for truth of surface, and all inequalities removed with a trying plane, so as to remove as little as possible.

Having made the joints true, the next question is glueing the two halves together. For this purpose, glue of special strength will have previously been obtained.

Before spreading the glue, the surfaces of the two halves of the span are frequently ironed with a hot iron, so as not to let the glue grow cold and partially set before the two halves can be placed together.

Great care indeed must be taken quickly and very evenly to spread the glue, which should be done with a brush of moderate size and good quality. After this, the two surfaces should be slightly rubbed together and quickly and evenly clamped up and left to dry in a temperature of about 65 deg. for a couple of days.

The spars having thoroughly dried, can now be taken out of the clamps and sent to the wood-finishers, who will dress off the outside of the spar to the finished dimensions, taking considerable care to leave the spar all over a bare 1/32 in. full.

The spar can now have the holes for the hinge-bolts and fittings marked off and the holes drilled on the drilling machine.

(To be continued.)

COMPONENT PARTS.

Aircraft constructors will do well to note that the British Gold Shell Ring Co., Ltd., of Hounslow, Middlesex, are in a position to give early deliveries of all kinds of small metal parts for aircraft work.

The special plant at their disposal is peculiarly suited for turning out such parts as shackles, cable-guides, etc., and stocks of various parts are available for immediate delivery. The firm is open to quote for the manufacture of any component in quantities upon receipt of specimen and specification.

A TRADE NOTE.

The Nieuport and General Aircraft Co., Ltd., of Langton Road, Cricklewood, London, N.W.2., wish it to be noted that in order to prevent misunderstanding and confusion, the above is their registered and only address, to which all communications should be sent. They have no agent whatever in London or elsewhere, and Major S. Heckstall-Smith is the general manager of the business of the company. The firm's telegraphic is "Nieuscout," Crickle, London, and the telephone is 2455 Willesden.

AN AUSTRIAN AIRCRAFT CONCERN.

"The Phönix Aircraft Works" have been formed in Vienna with a capital of 1,000,000 crowns, to be raised soon either to three or five million. The moving spirit of the concern is Director Gabriel of the Austrian Albatros Company, formed on the outbreak of war, and it has been agreed that the latter firm shall continue with experimental aeroplanes only, and sell the exclusive rights of the produced aircraft to the Phönix Company.

LANG PROPELLERS U.S.A.

An advertisement in the "Aerial Age Weekly" of July 2nd, announces the formation of the Lang Propeller Company, of America. Mr. A. Dashwood Lang, of Weybridge, recently went to America, and there is no doubt that his presence in the United States will contribute materially to the success of the new American Air Fleet. Correct propeller design is an essential factor in the construction of an efficient aeroplane, and Mr. Lang is accustomed to produce airscrews for every conceivable type of aircraft, from the biggest airship to the smallest scout.

The older members of the British Aircraft Industry will remember Mr. Lang's early experiments at Brooklands, and his subsequent work with the British and Colonial Aeroplane Co., Ltd. Since that time he has steadily applied himself to the design and construction of airscrews for big and small aeroplanes, seaplanes and airships. The quality of his work has never been surpassed, and he was particularly successful in metal-tipping seaplane propellers.

For the time being correspondence should be addressed to Mr. Lang, c/o "The Aerial Age," Box 178; 280, Madison Avenue, New York, U.S.A.

A MIDLAND DEPOT.

The London firm of S. Smith and Sons (Motor Accessories), Limited, wish it to be noted that they have opened a service depot, for the convenience of Midland traders, at 122, Alma Street, Birmingham. This depot carries a full range of the firm's well-known accessories, and the new departure will doubtless save considerable time in the fulfilment of orders.

At the Milan Aero Show.

By T. S. Harvey.

All but two of the twenty Hun engines at the Milan Show are shown unmounted. One of the two, a Daimler, is on the Aviatik (No. 76 in "La Guerra"), a machine which was repainted and flown by Baracca till a stop had to be put to the confusion resulting therefrom. The other is on a much done-in machine and not identifiable.

Motor beds seem mostly of wood reinforced at the angles by steel corner pieces. The excessive number of cylinders, bolts, and everything dismountable, on both and every side or end, speaks of method run mad or intense stupidity. The use of different coloured wires, H.T. wires from magnetos, is much to be desired, too.

The workmanship of the small "running-repair mechanic" appears bad. I noted, too, very few of the original magnetos on the engine, possibly because of the sea water in which so many of the machines took their last dip. Radiators, when present, are small, so presumably cooling is ultra-efficient. Every tube and pipe is swathed in felt, asbestos, etc.

The Hiero Motor.

Very battered and worn were the Warchalowskis, and the Hiero, their cousin, while the dozen Austro-Daimler and Mercs. ranged from engines of 1913 to a new Merc., modified internally, No. 25076.

The following description of the Warchalowski applies to the Hiero apparently, a more modern and ear-soothing name chosen by Warchalowski and Tissler and Co., of Vienna, for much the same motor. [The name came, one believes, from the fact that the engine was designed by Hieronymus, the famous driver of racing cars.—Ed.]

These engines seem to have been mostly fitted to seaplanes. The 215 h.p. is obtained from six cylinders set separately, three by three on the crankcase, to which they are attached by big wing-bolts.

Between the third and fourth cylinders passes a vertical shaft which drives the overhead valve cam-shaft the two mags., and the pumps. Independent dual ignition with two plugs per cylinder, half compression actuated by forked lever displacing a cam-shaft, and an inspection window in the crank-case, are good points. The motor, owing to the space occupied by this vertical shaft, is very long.

The Hiero has a hefty trumpet-shaped expansion chamber into which the burnt gases are led by the normal exhaust pipes. There is only one other "silencer" in this part of the show, and, perhaps, in the whole exhibition.

The "Rapp," of which there are two examples, is a six-cylinder two by two water-cooled 165 h.p. vertical, with overhead cam-shaft of early date. Two magnetos, a carburettor "Zenith Vergaser," and a crude but no doubt effective silencer are fitted, and the use of semi-elliptical six-leaf springs for the valves is a feature.

The outstanding feature among the power plant at the Show is the omnipresence of the 6-cyl. vertical engine. There is not a single example of any other type among the 20 odd captured Hun motors, and among the new Italian-built engines exhibited the exceptions could be counted on one handful of fingers.

The Aeroplane Exhibit.

The "Italian Military Aviation" exhibit, in a large tent-hangar, is composed of about twenty different motors used by the Aero Corps since the very beginning till to-day, and is about as instructive an exhibit as man could hope for. It ranges from an immensely ancient Wright 30-h.p., with a 4-cylinder vertical water-cooled car type, to a large Salmson and a Spad with an open V, Hispano-Suiza, through horizontal Darracqs, and every kind of exciting and mischief-bringing contraptions, such as one knew in the good old days when a city could be wrought to enthusiasm by a long hop.

I noted a 4-cylinder Colombo, a water-cooled car type, which did good service in early days, and has now developed into a 6-cylinder, much used at the front on Savoia-Farmans, and of which the Bianchi firm are, I believe, the builders by licence.

Nor is the V motor much in evidence, with the exception of a very big 12-cylinder Nagliati, on Renault lines, to all appearances, and of the performances of which, if any, I can say nothing.

The Isotta-Fraschini and Fiats stand out, of course, being engines now fitted to the greater part of the aeroplanes built by the Caproni, Pomilio and Fiat concerns among many others.

Their general lines are familiar to everyone, as both rely on perfection of normal practice by attention to detail rather than on any distinctly original feature. The Isotta-Fraschinis, whose designs are, I believe, Government property, are also built by several of the better known car firms, and by the big firm of Tosi at Legnano. A beautifully sectioned engine of this build was shown, each cylinder of which was shamelessly laid bare from a different point of view.

A big 8-cylinder, on the same lines, was to be seen mounted on the central body of a 600-h.p. Caproni triplane.

The later 250 Fiats were not exposed, being, I gather, more needed elsewhere. According to D'Annunzio, it is a "God-motor." Anyway, the Show expressly proclaims itself not "up-to-date."

In dealing with the more recent part of the Show, and some accessories of the myriads exhibited, I feel bound, in gratitude to the designer, to begin by naming the ever-popular Nieuport, a "Baby," which MM. Macchi, of Varese, were showing, presumably, merely not to be absent. A view of some of their other products would give to think. Luckily for the Allies the firm's output more than suffices for the needs of these evil days.

Next to them an unwinged Pomilio was well attended to by a show-woman, and drew a throng.

The Società Anonima Meccanica Lombarda, of Monza, and elsewhere, had a neat school biplane with their own 150-h.p. vertical 6-cylinder (a motor on standard lines). The machine has dual-control and plenty of surface; a type which is much used officially. The many merits of the S.A.M.L.'s other craft are best left alone at present.

Models of a "cruiser" by Frattini—held, *on dit*, in much esteem, and, hence, to be passed over—and of a biplane, designed by Engineer Darbesio, of the "Asteria," and a real pioneer, attracted the eyes of the "*conoscitori.*"

A wonderful collection of Service photos, doubtless of supreme value in their time, were there for the conversion of the hard-hided, and the instruction of the half-baked. Exhibited by the squadron which obtained them, each collection is a document of the prowess of the men belonging to it.

The photographs of the dirigible section showed how correct were the designers of the early vessels of the "M." series, a series which seems almost unmodified during the last two intense years, if one excepts slight improvements to the gun-turret on the forward deck (or back?) and some re-arrangement of the control surfaces, probably to meet the increased motor kick and general improved efficiency in lift.

The firm which has to do with the "Forlanini" show much of technical interest, such as valves, keel-construction, etc., as well as photos of the various vessels of the series, about which silence were golden.

Engineer Canovetti's incessant mental activity is responsible for an ejector, which, however, for want of time and a teacher, I must sidetrack till I can get a first-hand explanation of it.

Only one freak aeroplane was there to puzzle us. Not to be mixed up with helicopter or orthopter, the "Somalvico" circular aerofoil, from which a fuselage with its power plant is suspended by a universal joint, revolves in the reverse direction to the normally placed propeller. In its normal position the section of the circular plane (or planes) is roughly that of a shallow hand-basin *in use*, and so resembles an inverted umbrella. Stability and parachute properties are claimed, and the model has given unexpected results. [A delightfully non-committal, if ambiguous, phrase.—Ed.]

All over the show, mounted and not so, one sees the Marelli magnetos. A four-spark per rev., with separate commutator for even numbered multi-cylindered engines, is an extraordinary and compact little instrument.

The new Redini carburettor is merely a butterfly throttle, in a tube, with, loosely attached, a much tapered needle lying in the petrol pipe which enters the induction tube just below the throttle.

As the butterfly valve is opened or shut, it pulls the needle up or down the petrol pipe, which is thus gradually freed or obstructed, so that more or less petrol passes. Thus a variable jet effect is obtained simply and most cheaply. The Redini device is shown fitted to inlet pipes of various motors.

Garlaschelli, of Milan, has a stand of big petrol and oil tanks. Those for the big Caproni, gorgeous in coppered aluminium (?), attract the eye and the fingers that tap.

Electrically-heated clothing is the effort which the F.A.R.E. Co., of via Pietro Maroncello, Milan, is making to equip one for the altitudes to which "archies" are driving pilots, with the assistance, be it said, of the bigger motors everywhere foreshadowed. Gloves, with press-button fasteners as contact-makers, inner soles, head-covering, oil-pipe-heaters, and manifold other applications of their idea, are exposed to make the perspiring visitor envious.

Cabinet making, that old Italian industry, has found its feet again, and is well represented by Zari Bros., who, for instance, stage boat bodies, floats and fuselages for well-known types, all admirable.

Excellent, too, is the woodwork of Attilio Mazzi.

Metallurgy and its professions are too numerous to be even sorted out. That the Italian industries, unshackled from foreign subsidised competition, should have been able to rise so satisfactorily to the occasion is no surprise. The pity is that it could not have been done earlier. No other nation has suffered so from undue modesty, charming, but not business.—T. S. Harvey.

Standardisation in the United States.

"Aerial Age" (New York) of May 21st, states that at a meeting of the Automotive Association Mr. F. S. Duesenberg read the report of the Aeronautic Division.

In the discussion it was brought out that the Stick control is largely favoured for light machines and the Deperdussin control, commonly known as the Dep., is favoured for heavier machines.

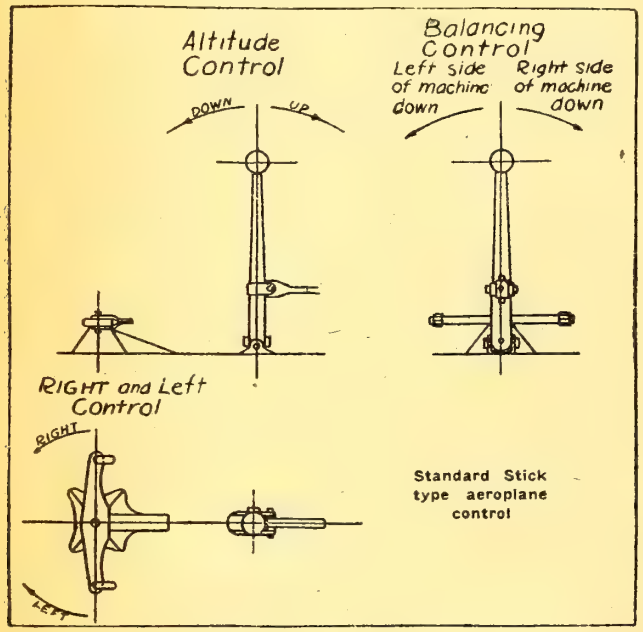
Probably one of the most important steps in view of the formative condition of the aeronautic industry was the decision to adopt the English or inch system of measurement because of the requirements of the United States Army and Navy service.

A letter was read from R. S. Griffin, engineer in chief of the United States Navy Bureau in Washington, in which he stated that the following suggested standards taken from the report are acceptable to the Navy Department:

(1). English system of measurement.
(2). Marking oil and fuel lines.
(3). Elimination of gauge numbers.
(4). Engine supports.
(5). Spark plugs.

He also suggested that a rubber tube be used to connect the gasoline tank to the carburettor, and the Bureau has asked for specimens of the wire and turnbuckle fittings described in the report. In other words, the Bureau is still questioning the wire tensile strengths, thimbles, turnbuckles and tachometer shaft drive.

CONTROLS.—It is found that these two types of control, namely, the Deperdussin (Dep.) and Stick controls are necessary to cover most types of plane in military use. The standards specify that particular movements produce particular effects, but do not specify the connections, since these vary a great deal in practice.



ELIMINATION OF GAUGE NUMBERS.—Sheet metal is to be specified by thickness in decimal fractions of an inch. Rods, wires and cables are to be specified by diameter in decimal fractions of an inch. Tubes are to be specified by outside diameter in inches or fractions and thickness of wall in decimal fractions of an inch.

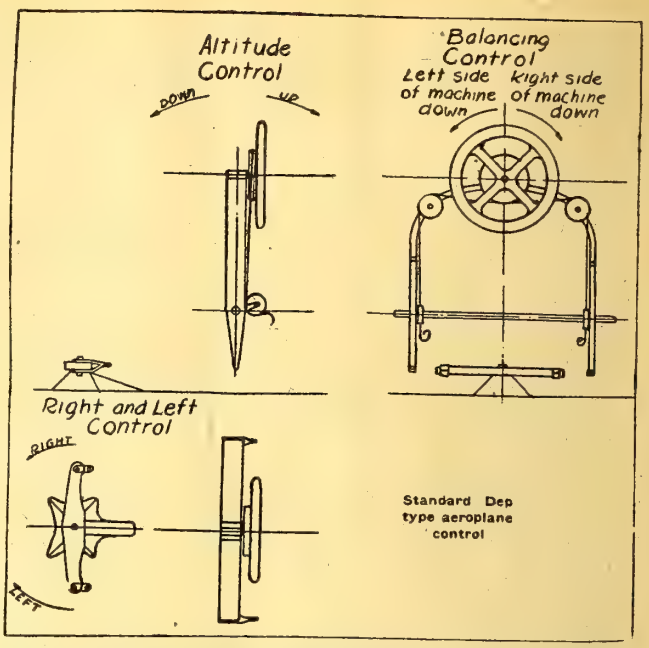
ENGINE SUPPORTS.—The division recommends the following table of dimensions, omitting all reference to sizes of bolts:

Distance between timbers	12	14	16
Width of bed timbers	2	2¼	2½
Distance between centres of bolts	14	16¼	18½

BASIC SYSTEM OF MEASUREMENTS.—In view of the fact that the Army and Navy Departments are not both in favour of adopting the metric system, and further, in view of the necessity of arriving at standards that will mean the least possible delay in the production of aeroplane parts, this division recommends definitely to use the English system of measurement except in isolated cases such as spark-plug threads where the metric system is desirable in order to effect interchangeability with some well established standard.

SPARK PLUG DIMENSIONS.—The following dimensions for spark plugs were agreed upon:

Thread: 18 mm., 1½ mm. pitch.



Form of thread: International standard. (Same as U.S. standard only with one-half as much truncation at root of thread.)

Gasket shoulder to end of shell: ⅝ in.

Hexagon: 1 in. across flats.

The question of thread tolerances was deferred.

PROPELLER HUBS.—The design of propeller hubs of various sizes should be based upon pounds-feet torque and not on horse-power.

DIRECTION OF ENGINE ROTATION.—The direction of engine rotation is normal when the final power delivery member of the engine rotates anti-clockwise, viewed facing the power delivery end. Opposite rotation is anti-normal.

DETAILS FOR PLANES.

HARD WIRE LOOP.—This consists of an oval coil of wire through which the hard wire is slipped, bent in the form of a loop, again inserted, and the end bent over against the coil. The whole is then soldered. This is identical with the present British standard.

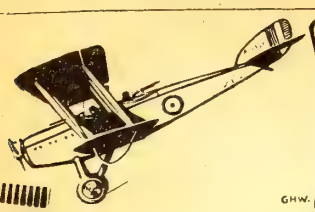
FLEXIBLE CABLE ENDS.—The sketch shows the cable end wrapped around a "standard thimble." The length of splice from pointed end of opening in thimble was represented by "splice plus or minus ⅛ in." The end of the splice is wrapped with a serving of shellacked harness thread. Dimension A represents the distance from end of opening in thimble to end of serving.

Diameter of Cable.		Length of Splice.	Number of Tucks.	Length of Serving.	A	Full Strength of Cable.
3/32	7 × 14	1¼		1	½	800
1/8	7 × 19	1½	3 over	1	½	2000
5/32	7 × 19	1¾	core buried	1¼	½	2800
3/16	7 × 19	1⅞	4 under	1¼	¾	4200
3/32	7 × 19	2⅝		1¼	¾	5600

GALVANIZED NON-FLEXIBLE ENDS.—The cable end is wrapped about a thimble, with a total length of splice indicated by L; 0.041 in. soft steel wire is to be used for wrapping, and the sketch indicates two spaces left between convolutions of the wrapping wire, width of the spaces being indicated in the table. The accompanying table gives the sizes and strengths:

Diameter of Cable.		L	Space.	Wind.	Full Strength of Cable.
1/16	1 × 19	1½	⅛	1	500
3/32	1 × 19	2	⅛	1¼	1100
1/8	1 × 19	2½	⅛	1½	2100
5/32	1 × 19	2¾	⅛	2	3200
3/16	1 × 19	3	3/16	2¼	4600
7/32	1 × 19	3½	3/16	2¼	6100
¼	1 × 19	4	¼	2½	8000

THIMBLES.—It was voted to approve, subject to approval by the departments of War or Navy, thimbles for wire ends as shown by Plate No. 7 following page 118, First Annual Report



The Aeroplane

Acetylene Welding Plant—

Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—

Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation, Newcastle-on-Tyne."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2 City 7724.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.

Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."

Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."

Martinsyde, Ltd., Brooklands, Byfleet. Woking 331; Byfleet 171. "Martinsyde, Weybridge."

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455 "Nieuscout, Crickle, London."

Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."

Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerfyta, Knights, London."

Waring & Gillow, Ltd., Hammersmith. Museum 5000. "Warisen, Ox, London."

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

White, J. Samuel, & Co., Ltd East Cowes. Cowes 3. "White, East Cowes."

Airships—

Airships, Ltd., High Street, Merton. Wimbledon 1314.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, 'Phone, London."

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Bizfibild, London."

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.

The Wilfley Co., Ltd., Salisbury House, London Wall, E.C.2 City 2681-2. "Wrathless, Phone, London."

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Castings (Aluminium)—

Coan, R. W., 219, Goswell Road, London, E.C.1 City 3846. "Krankases, Isling, London."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."

London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."

Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—

Accles & Pollock, Ltd. Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."

B. D. V. Aircraft Spares, Syon Chambers, 16a, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—

British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."

British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Clarke, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Elastic Cords—

Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—

E. Kalker & Co., Coventry. Coventry 24 "Kalker, Coventry."

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford 1. "Pump, Bedford."

Arrol-Johnston, Ltd., Dumfries. Dumfries 281-182. "Mocar, Dumfries."

The Beatty School of Flying, Ltd., The Broadway, Crickiewood, N.W.2. Hampstead 30

Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. Gerrard 238. "Beardmore, London."

Dudbridge Iron Works, Ltd. (Salmson), Victoria Street, London, S.W.1. Vic. 70 "Aeroflight, Vic., London."

Gordon Watney & Co., Ltd., Weybridge Weybridge 550 (7 lines). "Mercédès, Weybridge."

Green Engine Co., Ltd., Twickenham Richmond 1293.

Gwynnes, Ltd., Hammersmith Iron Works Hammersmith, W. Hammersmith 191 "Gwynne, Hammersmith."

Sturtevant, B. F., Co., Ltd., Hyde Park, Boston U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Moorfie Wolverhampton."

The Gnôme & Le Rhône Engine Co., Ltd. 47, Victoria Street, S.W. Walthamstow 408 (2 lines). "Elevenfold, London."

Willans & Robinson, Ltd., Victoria Works Rugby. Rugby 112 (3 lines). "Willans Rugby."

Flying Schools—

Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. Bournemouth 11 "Etches, Winton."

Cambridge School of Flying & Aerodrome Co. Ltd., 30b, St. Andrews Street, Cambridge

Galvanising—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich"

Cowper-Coles Manufacturing Co., Sunbury-on-Thames. Sunbury

Gears—

Moss Gear Co., Ltd., Thomas Street, Aston Birmingham. East 407. "Mosgear, Birmingham."

Glue—

Adams & Co., Ltd., West Bromwich. Bromwich 264. "Reliance, West Bromwich"

Improved Liquid Glues Co., Ltd., Gt. Hermitage Street, E. (Croid.). Avenue 31 "Excroiden, Wapp, London."

Mendine Co., 8, Arthur Street, E.C. Bank 58

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 13 "Shatterlys, Piccy, London."

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines "Comyn, Ching, Westcent, London."

Chas. P. Kinnell & Co., Ltd., 65 & 66 Southwark Street, London, S.E.1. H 372 (2 lines). "Kinnell, London."

Instruments—

British Wright Co., Ltd., 33, Chancery Lane W.C.2. Holborn 13

Machine Tools—

Brewster & Co., 11, Queen Victoria Street E.C.4. City 768. "Circumfuse, Canno London."

Magnetos—

The M-L Magneto Syndicate, Ltd., Victor Works, Coventry. 1908-1009 Coventr "Corlton. Coventry."

The British Lighting & Ignition Co., Ltd 204, Tottenham Court Road, W.1. Museu 430. "Vicksmag, Phone, London."

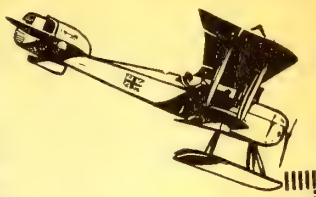
Metal Manufacturers—

Chas. Clifford & Sons, Ltd., Birmingha Central 42-43. "Clifford, Birmingham."

Metals in General—

Lucraft, H., & Co., 147, Fenchurch Stree London, E.C.3. Avenue 2217. "Lucrafti London."

Buyers' Guide.



ɔtal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."
Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C Holborn 858. "Upcast, Holb, London."
Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2297.
Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041. "Bayliss, Wolverhampton."
The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Foster Engineering Co., Wimbledon. Wimbledon 1800 (3 lines) "Fosteraco, London."
Mann, Egerton & Co., Ltd., Aircraft Works, Norwich. Norwich 482. "Motors, Norwich."
Mountford, Fredk., Ltd., Fremo Works, Lilford, Birmingham Kings Norton 261. "Fremo, Birmingham."
Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."
Selsdon Engineering Co., Ltd., Croydon. Croydon 1761-123. "Selig, Cent, London."
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."
Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

ɔtric Bolts—

Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

scellaneous—

Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."
Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C. Central 3731.
Bowdon Wire, Ltd., Willesden Junction. Willesden 2400 (3 lines). "Bowirelim, Harles, London."
Brown Bros., Ltd., Great Eastern Street, E.C.1. London Wall 6300. "Imbrowned, Bethroad, London."
Edison Swan Electric Co., Ponder's End. (Lamps). Enfield 520 (6 lines). "Ediswan, Enfield."
Herbert Frood Co., Ltd., Chapel-en-le-Frith. Central 793. "Frodobrake, Birmingham."
Glasso Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.
London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

ɔtor Cars—

Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
Standard Motor Car Co., Coventry. Coventry 530 (4 lines). "Flywheel, Coventry."

ɔservation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

ɑckers, Shippers, Etc.—

Lep Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depolep, London."

ɑtent Agents—

King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.
Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.
Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

ston Rings—

British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

ɔwer Presses and Dies—

Bliss, E. W., Co., 2a, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissdon, London."

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."
Integral Propeller Co., Ltd., Hendon 9, Kingsbury 104. "Aviprop, Hyde, London."
Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."
Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Stanley Aviation Co, 67, Kingsland Road, E.2. City 8347.
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil"

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—

C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. Chapeltown 474 "Instrument, Leeds."

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The Norman Thompson Flight Co., Ltd., Middleton, Bognor Bognor 48. "Soaring, Bognor."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Short Bros., Rochester. Chatham 627. "Seaplanes, Rochester."
Supermarine Aviation Co., Ltd., Southampton Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.
Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."

Shock Absorbers (Elastic Cord)—

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—

Forward Motor Co., Summer Row, Birmingham. Central 6259.
Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.
Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."
Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—

Dart Spring Co., West Bromwich. West Bromwich 322 "Dart, West Bromwich."
Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—

Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."
Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield"

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—

Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lilford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—

John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.
James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London"
R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."
The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Weskent."

Varnishes—

Clarke, R. Ingham, & Co., Caxton House, S.W.1. Victoria 2023. "Pearline, Vic, London."
Harland, W., & Son, Merton. Wimbledon 45.
Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."
Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Watchmakers and Jewellers (Silver Models)—

Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—

Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."
London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—

Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wiremill, Musselburgh."
Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Woodworking Machinery—

Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."
Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."
Wadkin & Co., Leicester. Leicester 3614. "Woodworker, Leicester."

The Aeroplane Buyers' Guide.

Acetylene Welding Plant—
Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—
Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."
Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation. Newcastle-on-Tyne."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."
British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."
Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.
Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2 City 7724.
Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.
Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1170. "Aircraft, Eastbourne."
Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."
Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."
Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."
Martinsyde, Ltd., Brooklands, Byfleet, Woking 331; Byfleet 171. "Martinsyde, Weybridge."
National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.
"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455 "Nieuscout, Crickle, London."
Norman-Thompson Flight Co., Ltd., Bognor Bognor 48. "Soaring, Bognor."
Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."
Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."
Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."
Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2 City 80. "Gunsligerush, Estrand, London."
Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerlyta, Knights, London."
Waring & Gillow, Ltd., Hammersmith. Museum 5000. "Warisen, Ox, London."
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."
White, J. Samuel, & Co., Ltd East Cowes. Cowes 3. "White, East Cowes."

Airships—
Airships, Ltd., High Street, Merton. Wimbledon 1314.
Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Aluminium Castings—
Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."
Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—
Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Bearings (Etonia Cast Phosphor Bronze)—
Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Bizfibild, London."
Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.
The Whitley Co., Ltd., Salisbury House, London Wall, E.C.2 City 2681-2. "Wrathless, Phone, London."

Carburettors—
Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—
Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217 "Lucraftia, London."

Castings (Aluminium)—
Coan, R. W., 219, Goswell Road, London, E.C.1 City 3846. "Krankases, Isling, London."
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—
Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—
Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."
London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London"

Clothing—
Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.
Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."
Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.
Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—
Accles & Pollock, Ltd. Oldbury, Birmingham. Oldbury 111 (4 lines) "Accles, Oldbury."
B. D. V. Aircraft Spares, Syon Chambers, 162, Kew Road, Richmond, Surrey. Richmond 1682. "Aeros, Richmond."
Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aerocracons, Canning, London."
The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—
MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—
British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."
British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellulnite, London."
Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."
Clarke, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Elastic Cords—
Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—
The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—
E. Kalker & Co., Coventry. Coventry 401. "Kalker, Coventry."

Engines and Parts—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford 1. "Pump, Bedford."
Arrol-Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 300.
Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. Gerrard 238. "Beardmore, London."
Dudbridge Iron Works, Ltd. (Salmons), Victoria Street, London, S.W.1. Vic. 708. "Aeroflight, Vic, London."
Gordon Watney & Co., Ltd., Weybridge. Weybridge 550 (7 lines). "Mercedes, Weybridge."
Green Engine Co., Ltd., Twickenham, Richmond 1293.
Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. Hammersmith 190. "Gwynne, Hammersmith."
Sturtevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.
Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Moorfield, Wolverhampton."
The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W. Westminster 408 (2 lines). "Elevenfold, London."
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Flying Schools—
Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. Bournemouth 128. "Etches, Winton."
Cambridge School of Flying & Aerodrome Co., Ltd., 36b, St. Andrews Street, Cambridge.

Galvanising—
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Cowper-Coles Manufacturing Co., Sanker-on-Thames. Sunbury 5

Gears—
Moss Gear Co., Ltd., Thomas Street, Aston, Birmingham. East 497. "Mosgear, Birmingham."

Glue—
Adams & Co., Ltd., West Bromwich. Bromwich 263. "Reliance, West Bromwich."
Improved Liquid Glues Co., Ltd., 61, Hertford Street, E. (Croid.). Avenue 378. "Excroiden, Wapp, London."
Mendine Co., 8, Arthur Street, E.C. Bank 850

Goggles—
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Heating and Ventilating—
Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines). "Comyn, Ching, Westcent, London."
Chas. P. Kinnell & Co., Ltd., 65 & 93, Southwark Street, London, S.E.1. Hop 372 (2 lines). "Kinnell, London."

Instruments—
British Wright Co., Ltd., 33, Chancery Lane, W.C.2. Holborn 798

Machine Tools—
Brewster & Co., 11, Queen Victoria Street, E.C.4. City 768. "Circumfuse, Cannon, London."

Magnetos—
The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. 1908-1009 Coventry. "Corlton, Coventry."
The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. Museum 430. "Vicksmag, Phone, London."

Metal Manufacturers—
Chas. Clifford & Sons, Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

Metals in General—
Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Metal Parts and Fittings—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."
Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858.
"Upcast, Holb, London."
Arnall & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2207.
Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041.
"Bayliss, Wolverhampton."
The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines).
"Propellors, Leeds."
Foster Engineering Co., Wimbledon. Wimbledon 1800 (3 lines) "Fostercaco, London."
Mann, Egerton & Co., Ltd., Aircraft Works, Norwich. Norwich 482. "Motors, Norwich."
Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261.
"Fremo, Birmingham."
Robert, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."
Seddon Engineering Co., Ltd., Croydon. Croydon 1761-123. "Selig, Cent, London."
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aerocracons, Canning, London."
Thompson Bros., Ltd., Bradley, Bilston, Bilston 10. "Thompson Bros., Bilston."

Metric Bolts—
Cashmore Bros., Zeta Works, Hildreth Street, Balham, S.W. Battersea 475.

Miscellaneous—
Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."
Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C. Central 3731.
Bowden Wire, Ltd., Willesden Junction, Willesden 2400 (3 lines). "Bowirelim, Harles, London."
Brown Bros., Ltd., Great Eastern Street, E.C. London Wall 6300. "Imbrowned, Bethread, London."
Edison Swan Electric Co., Ponder's End, (Lamps), Enfield 520 (6 lines). "Ediswan, Enfield."
Herbert Frood Co., Ltd., Chapel-en-le-Frith, Central 703. "Frodobrnke, Birmingham."
Gano Manufacturing Co., Ltd., 211, City Road, E.C. City 6558.
London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London"
MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—
Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
Standard Motor Car Co., Coventry. Coventry 850 (4 lines). "Flywheel, Coventry."

Observation Panels—
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Packers, Shippers, Etc.—
Leg Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depolep, London."

Patent Agents—
King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 680.
Page & Rowlinson, 27, Chancery Lane, E.C.4. Central 332.
Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Piston Rings—
British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—
Bliss, E. W., Co., 23, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissdon, London."

Propellers—
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines).
"Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."
Integral Propeller Co., Ltd., Hendon 9, Kingsbury 104. "Aviprop, Hyde, London."
Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."
Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Stanley Aviation Co., 67, Kingsland Road, E.2. City 8347.
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

Rigging for Aircraft—
Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—
The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—
C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—
Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—
The Foster Instrument Co., Letchworth, Herts. Chapeltown 474. "Instrument, Leeds."

Seaplane Manufacturers—
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines).
"Propellors, Leeds."
The Norman Thompson Flight Co., Ltd., Middleton, Bognor Bognor 48. "Soaring, Bognor."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Short Bros., Rochester. Chatham 627. "Seaplanes, Rochester."
Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—
Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Sheet Metal Pressings—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.
Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."

Shock Absorbers (Elastic Cord)—
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—
Forward Motor Co., Summer Row, Birmingham. Central 6259.
Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.
Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."
Ripault, Leo, & Co., Ltd. (Oleo Plugs), 642, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—
Dart Spring Co., West Bromwich. West Bromwich 322. "Dart, West Bromwich."
Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—
Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."
Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—
Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Steel Tubes for Aeroplanes—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—
Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—
John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.
James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester"

Timber—
Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entiksil, Vic, London."
R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—
Gledhill-Brook Time Recorders, Ltd., 36, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—
The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."
The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Westkent."

Varnishes—
Clarke, R. Ingham & Co., Caxton House, S.W.1. Victoria 2023. "Pearline, Vic, London."
Harland, W., & Son, Merton. Wimbledon 455.
Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 700 (2 lines). "Varnish, London."
Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Watchmakers and Jewellers (Silver Models)—
Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—
Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—
Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."
London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300.5 "Lonlabel, Canning, London."
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—
Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wirenill, Musselburgh."
Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Woodworking Machinery—
Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."
Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."
Wadkin & Co., Leicester. Leicester 3614. "Woodworker, Leicester."

of the National Advisory Committee for Aeronautics (1915). These thimbles will be shown by appropriate drawings. The sizes are indicated roughly by the following table:

Size of Rope.	Thickness of Thimble.	Width of Eye.	Length of Eye.
1/16-3/32	0.075	0.35	0.70
1/8	0.12	0.35	0.70
5/32	0.17	0.40	0.80
3/16	0.21	0.50	1.00
7/32	0.24	0.60	1.20
1/4	0.27	0.70	1.40
9/32	0.30	0.80	1.60
5/16	0.33	0.90	1.80
3/8	0.39	1.00	2.00

TURNBUCKLES.—Detail dimensions of both short and long types are being studied by a sub-division consisting of Chairman Manly and Capt. Clark. The following main dimensions are recommended for immediate adoption:

(With either two eye ends or one eye and one yoke end.)

	Short.	Long.
Length of Barrel	2	4
Length between Eyes:		
With threads flush with ends of barrel	4	8
With maximum extended	4 3/16	8 3/16
With minimum extended	3 1/4	5 1/2

Strength (lbs):

S.A.E. Numbers.	Short.	Long.
1	500	500
2	1000	1000
3	1500	1500
4	2000	2000
5	2500	2500
6	3000	3000
7	3500	3500
8	—	4000
9	—	4500
10	—	5000
11	—	6000
12	—	7000
13	—	8000
14	—	9000
15	—	10000

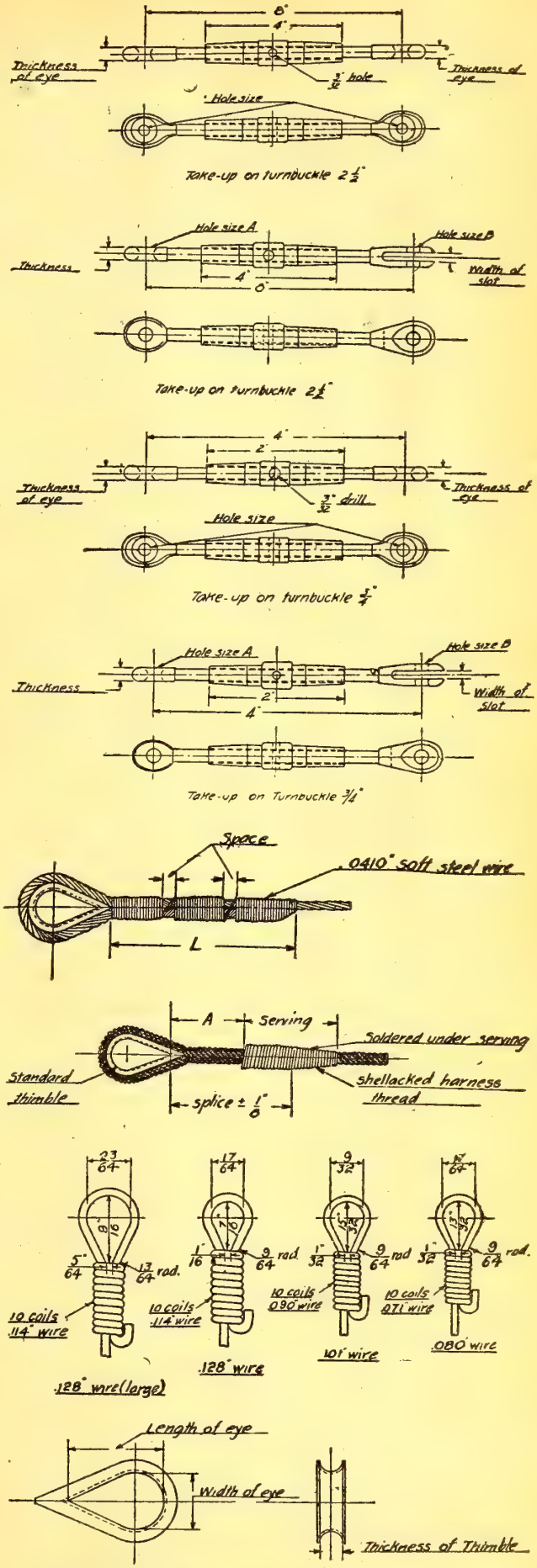
MARKING PIPE LINES.—Gasoline lines should be marked with red stripes ½ in. wide painted around the pipes 24 in. apart, care being observed that there is a stripe near each end of the pipe. The oil lines to be marked similarly but with white stripes.

AERONAUTIC WORK STILL IN PROGRESS.

A sub-division consisting of Messrs. Vincent, Crane and King has been appointed to take up the subject of pipe fittings. Data are also being collected regarding high grade alloy steel tubing. Some revision of the propeller shaft end dimensions is under consideration. Professor Z. Jefferies, Aluminium Castings Company, and K. W. Zimmerschied, chairman of the iron and steel division, have been requested to submit suggestions in regard to aluminium alloy specifications.

Three recommendations contained in the report were referred back to the division. The first of these suggested certain standard sizes for tyres and rims; the second was a suggested standard design for a tachometer driveshaft, and the third was an acceptance for aeronautic work of the existing iron and steel standard specifications.

J. E. Hale, Goodyear Tyre and Rubber Company, inquired regarding the tyre sizes which he said are all new. On the other hand, the 26 by 4 has been popular with production running into the thousands and yet these are not mentioned in the report. Duesenberg stated that in the committee meeting no one had made any objections to the tyre sizes, although no tyre men were present. Hale stated that none of these tyres are made, but this is a matter which should be considered, and although the situation is by no means grave owing to the relatively small production, it would be a question of making matters much more simpler if existing sizes could be used. Duesenberg pointed out that the 32 by 4½ tyre is easily secured and is the normal size for the popular 33 by 5 oversize tyre used extensively in racing.



AEROPLANE FITTINGS—Suggested standard forms of long and short turnbuckles, flexible cable ends and stay wire loops

THE PATENTS INDEX.

The subjoined list of recent inventions has been specially compiled by The Aeroplane from the current Official Patents Records.

Patent Applications.

Brown, E. Anti-aircraft balloons. No. 10065. July 12th.
Burns, J. Aviators' safety planes. No. 9996. July 11th.
Carr, M. F. Aerial bomb. No. 10190. July 13th
Chilman, F. A. Steering apparatus for aircraft. No. 10089. July 12th.
Dreyfus, H. Fabric for aircraft, etc. No. 9963. July 10th.
Gooch, F. C. Carriage of parachutes for aeroplanes, etc. No. 9979. July 10th.
Gooch, F. C. Aircraft. No. 9980. July 10th.
Gridley, J. Frames of aircraft. No. 10087. July 12th.
Higgins, W. Aeroplanes. No. 9977. July 10th.
King, H. G. Flying-boat hull. No. 10053. July 12th.
Lamblin, A. Radiators for internal-combustion engines for aircraft, etc. No. 10192. July 13th.
Linden, L. Aircraft armament. No. 10103. July 12th.
Lord, J. Quick-release fastening for aviators' belts, etc. No 9990. July 11th.
Mascord, G. W. Aeroplnes. Nos. 9976 and 9977. July 10th.
Reid, L. H. Aeroplanes. No. 10177. July 13th.
Shannon, D. Aeroplanes. No. 9926. July 10th.
Shannon, D. Means for stabilising aeroplanes, etc. No. 9927. July 10th.
Sopwith Aviation Co. Means for synchronising firing of gun with rotation of propeller upon aeroplanes, etc. No. 10230. July 14th.
Thompson, N. A. Launching and landing aircraft. No. 10235. July 14th.
Thomson, T. Aeroplanes and dirigibles. No. 10165. July 13th.
Vickers, Ltd. Aircraft. No. 10039. July 11th.
Walker, C. S. Aeroplanes. No. 10099. July 12th.
Waterfield, T. Apparatus for automatically indicating angles of aeroplanes, motor-cars, etc. No. 9901. July 9th.

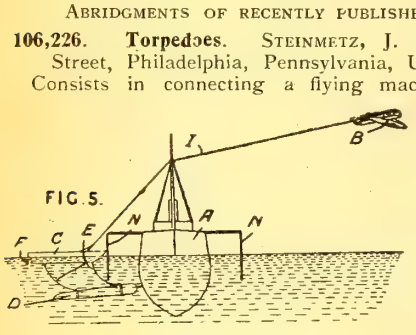
Complete Specifications Accepted, Prints of which are Obtainable on and after August 2nd, 1917.

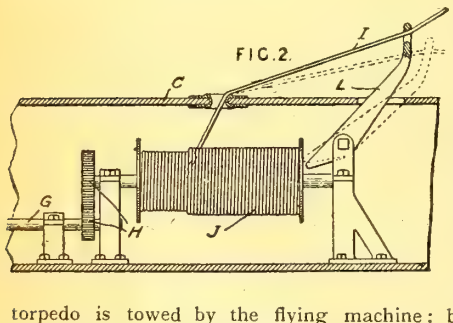
107,627. July 3rd, 1916. Schmelzer, B. Propelling devices.
107,662. July 17th, 1916. Chapman, F. W. Jointing clip or socket for light structures, such as aeroplanes and the like.
107,674. July 25th, 1916. Power, R. F. Control of aeroplanes.

Abridgments of recently published Specifications.

106,226. Torpedoes. Steinmetz, J. A., 10, North Fourth Street, Philadelphia, Pennsylvania, U.S.A.

Consists in connecting a flying machine by a cable to a torpedo supported by a float provided with a propelling-gear worked by a drum by the pull of the connecting-cable. In the form shown in Fig. 5, the torpedo comprises an explosives casing D and a float C propelled by a propeller F driven through a shaft G, Fig. 2, and gearing H by means of a drum J by the pull of the cable I connected to the flying machine B. When the machine is flying low or on the surface of the water, a lever L locks the drum J as shown in dotted lines and the torpedo is towed by the flying machine; but when the flying machine rises, the lever L is pulled up, releasing the drum, and the pull of the cable drives the drum. The explosives casing D is connected to the float C by chains E so that it may swing under the usual protecting-net N to strike the hull of the attacked ship A.

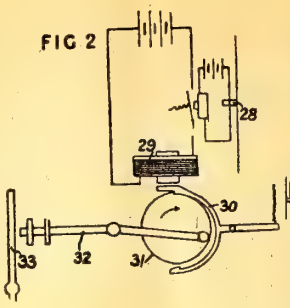


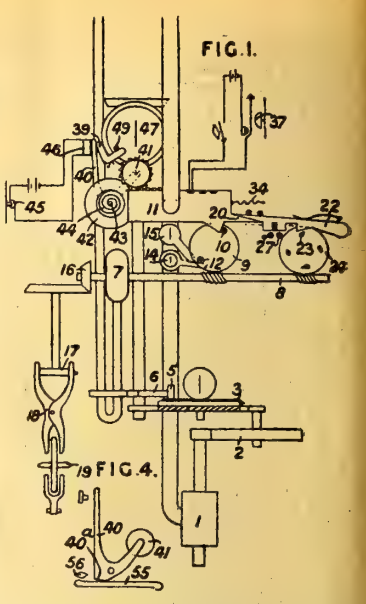


[This is genuinely humorous.—Ed.]

106,299. Aircraft and Torpedoes. King, W. J. H., 25, York House, Kensington, London.

Relates to aircraft and torpedoes provided with controlling-devices sensitive to sound or light emanating from an enemy craft so arranged as to cause the aircraft or torpedo automatically to hunt the enemy. According to the invention, the propelling-engine of the aircraft or torpedo is stopped intermittently while the hearing or seeing devices are put into action; the aircraft or torpedo may also be provided with sounding-devices adapted to produce an echo from the enemy when the enemy is silent, like a motionless submarine or a drifting airship. Several sound-receivers may be used, or a single one which is rotated and carries contacts for closing various controlling-circuits. Damping-devices may be added to vary the sensitiveness of the sound-receivers. The usual gyroscope is put out of action while the sound or light receivers are in action. Means are provided to adjust the time when the sound or light control shall begin, and to stop the motor until the receivers are affected by the presence of the enemy. The depth or height of the torpedo or aircraft may be controlled by a pressure gauge, and a pressure gauge may also be used to cut off the firing-circuits of explosive charges on the torpedo or aircraft to make these safe against surface ships or high buildings. In the form shown for torpedoes in Fig 1, the supply valve 6 of an auxiliary motor 7 is opened at the appointed time by a pin 5 on an adjustable friction disc 3 driven by clock-work or by gearing 2 from the main engine 1. The shaft 8 of the motor 7 drives two discs 9, 24 through worm gearing. Pins 10, 12 on the first disc 9 slide a valve 11 in the supply pipe of the main engine to control the intermittent stoppages and rock a valve 14 to control the speed during the intermittent action. The speed during continuous running is adjusted by another valve 15. Pins 23 on the second disc 24, in conjunction with the tail 20 of the valve 11, allow a spring switch 22 to fall on contacts 27 closing the circuit of microphones such as 28, Fig. 2. The slide valve 11 may also close the circuit of a bell 37 just before the microphone circuits are closed. When a microphone is actuated, it energises a solenoid 29 which rocks an anchor 30, allowing a disc 31 to be rotated half a revolution by a spring, and thereby to deflect a rudder 33. These parts return to their initial positions when the microphone ceases to be actuated. In a modification, the microphones control the rudders through a wheatstone bridge and a reversing-switch. The shaft of the motor 7 also drives a cam 17 through bevel-gearing 16, and this cam works a pair of jaws 18 for clamping the gyroscope 19 out of action while the microphones are in circuit. When the slide valve 11 is released by the pin of the disc 9, it is returned to the initial position by a spring 34, restarting the main engine 1; and the whole cycle of operations is repeated. To stop the engine when no sound is received, the slide valve 11 is checked by a pin 43 before it completes its stroke. The pin 43 is driven up in the path of the slide 11 by a screw connection with a wheel 42 driven by another wheel 41, which is itself driven by a rack on the slide 11. When sound is received by a microphone 45, it energises a solenoid 46, which pulls a double-armed lever 40, drawing the wheel 41 from the slide 11; a spring 44 then withdraws the pin 43, allowing the slide 11 to complete its stroke and the intermittent action to proceed. The lever 40 may be rocked to put the wheel 41 in and out of gear by means of a bell-crank 39, which is set by hand, or is controlled by a pin 49 on an adjustable friction disc 47 driven by clock-work or by gearing from the propeller shaft, in order to put the wheel 41 in gear after a given travel of the torpedo. For aircraft steered by seeing apparatus, the arrangement is similar, but the microphones are replaced by selenium or like cells. These cells may be made to receive one colour only, say red, by means of a condensing-lens and a prism, so that only illumination of the enemy aircraft by a searchlight with a screen of the same colour will affect the steering-devices. When a torpedo or aircraft is provided with both hearing and seeing devices, the seeing devices may be put in action when the engine is running and the hearing devices are out of action, or the seeing devices may be continuously in action. When seeing devices are used, the





ratchet-wheel 41 is definitely held out of action when once put out of action by the receiver 45. This is done by a spring 55, Fig. 4, adapted to engage a flat part 40a on the double-armed lever 40; the spring 55 is put in and out of action according to the setting of a cam 56. The connections of the light-responsive cells are changed over for aircraft to be used in daylight.

106,352. Aeronautics. PARKER, J. W., 22, Radnor Road, Harrow, Middlesex, and ABRAHAMS, E. GOLDSMIDT, 5, Albany Court Yard, Piccadilly, London.

PROPELLING.—The internal-combustion engine of an aeroplane or other aircraft is supplied with producer-gas from a generator using anthracite coal, coke, charcoal, etc. The calorific value of the gas may be increased by injecting liquid hydrocarbon instead of or in addition to the water usually employed. The generator described in Specification 23476/01 may be used.

MARKET REPORTS.

Prices given are for quantities on usual terms.

July 19th, 1917.

COPPER.—The Copper situation is far from satisfactory, due to the American workers refusing to agree to the reduction of wages, which is the result of a reduction in the market prices in U.S.A. There is no doubt whatever that the Government officials here are partly responsible for this state of affairs. In the first place, prices were fixed at a high level, and competition was eliminated. Naturally, the U.S.A. producers took advantage of this. Now that America has joined the Allies, the U.S.A. officials are fixing prices at a normal level, with the grave results referred to above. It is difficult to foresee what will happen, but it is generally agreed that the officials here must modify their control.

Prices still remain unchanged.

Copper Ingot (Standard)	£130 per ton.
Copper Sheets	£165 per ton.
Copper Tubes, S.D.	20½d. per lb.
Brass Sheets, 24 Gauge	16⅛d. per lb.
Brass Tubes, S.D.	17d. per lb.

TIN.—The Tin market has witnessed an unforeseen and rapid reduction. It is doubtful whether this decline will continue. Nevertheless, buyers appear to be holding back. The position is most uncertain, and the market still retains its erratic tendencies.

Comparative Prices.

To-day	£236 10 0
July 16th	237 10 0
July 11th	245 0 0
Last Month	249 0 0
Last Year	166 10 0

LEAD.—Supplies still remain the chief consideration, and we are pleased to say that the hopeful feeling reported last week continues unabated.

For the guidance of readers, we give below a few of the maximum prices fixed by the Ministry on April 6th last.

Virgin Pig Lead	£29 per ton, ex Ship.
Virgin Pig Lead	30 per ton, ex Store
Scrap Lead	26 per ton, ex Store.
	Nett.
White Lead, Dry	46 per ton, D/D, U.K.
Red Lead	42 per ton, D/D, U.K.
Sheet Lead	39 10s. per ton, D/D, U.K.

STEEL.—There is very little to add to last week's report, except that vast extensions are now in hand, which will have a very favourable influence on supplies. The Air Board are tightening their control of Aircraft Steels, but they have not yet decided what the prices of the various Steels will be. We are anxiously waiting for this information; in the meantime, manufacturers should note the following abstract from Air Board instructions.

ALLOY STEEL.

"The Steel manufacturers have been instructed that they are not to accept any orders for Alloy Steel for aircraft purposes which have not been sanctioned by the Department of Aeronautical Supplies. Any orders sent to them by aircraft contractors will be returned to these contractors.

"All orders for Alloy Steel must be sent in triplicate to the Air Board, Hotel Cecil, addressed to the Controller of Aeronautical Supplies, and marked for the attention of the assistant director of materials and accessories, S. (M.A.) 5, the usual copies being also sent to the A.I.D. If an aircraft contractor has preference for a particular maker's Steel, such preference should be indicated on the order, and every endeavour will be made to meet his wishes. The contractor's order must state the number of the contract for which the Steel is required and the date by which delivery is desired. Material must, unless special permission to the contrary be given, in every case be ordered in standard sizes and to Air Board specifications.

"After receipt of the order the aircraft contractor will, in due course, be informed by the Department of Aeronautical Supplies when delivery may be expected, and from whom delivery will probably be made. When delivery instructions are given a copy of such instructions will be sent to the aircraft contractor.

CARBON STEELS.

"Triplicate copies of orders for Carbon Steel must also be sent to the Air Board for approval before being placed: but the orders for these Steels will be placed directly with the Steel firms and will be invoiced in the usual way by the Steel firms to the consignee."

The United States have made an agreement with Steel producers there, whereby the whole of the Steel output of all mills will be available for the American Government, who have agreed to allow a reasonable profit in the price, which will be fixed by the Federal Trade Commission.

Prices here remain unchanged, although there is a rumour that prices must be increased. It is certainly very unlikely that there is likely to be any decline.

Current Average Prices.

R.A.F. 3A Steel, 38s. to 40s. per cwt., Basis.
R.A.F. 1B Steel, 78s. to 80s. per cwt., Basis.
R.A.F. 9A Steel, 32s. to 30s. per cwt.

ALUMINIUM.—Prices are unchanged, and supplies are very good.

Ingot	£225
Remelted	210

TIMBER.—This market still remains firm, and the issue of Admiralty stocks has not had any effect on merchant's prices, in fact, it is reported that the demands for Silver Spruce received by the Air Board exceed the stocks available, and there is very little to be obtained elsewhere. Shipments are very scarce owing to the impossibility of procuring shipping space.

We are strongly of the opinion that the powers that be do not realise how very serious the position is. Readers will remember that our respected Premier stated a short time ago that the Timber at present growing in this country was, if utilised, sufficient for our needs, and only a few days ago the late Minister of Munitions made the remarkable statement that the whole yearly output of Spruce produced in the United Kingdom was required, owing to the growth of the output of aeroplanes. This lack of knowledge of the requirements of this extremely important industry is very regrettable. The Government supplies of Mahogany and Walnut are available, but users appear to be a bit chary of the quality, and apparently prefer to pay a little more and have the liberty of selecting good wood.

Current Average Prices.

Silver Spruce, 17s., c.f.
English Ash, 13s. 6d. to 15s., c.f.
Walnut, 2s. 3d. to 2s. 6d., s.f.
Mahogany, 2s. 2d. to 2s. 4d., s.f.

Prices are for selection and delivery.

FABRIC.—Supplies are fairly satisfactory, but no official notification of the prices has yet been received, and the situation remains as reported last week.

THE U.S. STANDARD AIRCRAFT ENGINE.

The National Advisory Committee for Aeronautics has announced that the Aircraft Production Board has obtained the co-operation of "two of the foremost engine designers in the country, Messrs Vincent and Hall," in the production of the U.S. Standard Aircraft Engine.

The fundamental idea of the engine is said to be a unit cylinder, from combinations of which any desired power may be obtained. It is proposed at first to build engines in four sizes of 4, 6, 8, and 12 cylinders, with corresponding horse-powers of 100, 200, 300, and 400.

It is said that the engine has been evolved with the voluntary co-operation of engine draughtsmen belonging to the leading aeronautical and automobile companies of America.

It is stated that the "assembly" of this engine (which apparently means erection from parts made in various factories) will be undertaken by the Bureau of Standards, an institution which apparently partakes of the nature of the National Physical Laboratory, very much enlarged.

Full advantage will be taken of the expert knowledge of metallurgy possessed by the staff of the Bureau. It is also announced that the development of the engine will in no wise interfere with, or retard, the development of private manufacturers, but that, if anything, it should stimulate them to further effort.

Which is much what we used to be told about the Royal Aircraft Factory, and was believed by some people, till they found their own ideas being embodied in R.A.F. designs, which were sent out to be reproduced by non-aeronautical firms, while the originators of the ideas were left waiting for orders.

A NEUTRAL'S IMPRESSION OF AMERICAN AIRCRAFT.

BY A DANISH CORRESPONDENT.

When the liner passes the statue of Liberty, and you stand at the end of your journey, or the start of your aviation mission, you have as a genuine European an idea of American pre-war aviation as consisting of modest orders for the aircraft "works" of freak planes for death-challenging exhibition flights, and a total lack of the all-important Government backing.

As a traveller of war you are not spoiled by facilities afforded to acquaint yourself with the newest aircraft, so as a contrast, curious in world wartime, and even in the eleventh neutral hour of the country, the Pan-American Exposition was an easy chance of observing many of the newest United States aviation products

And your impressions? Coupled with the idea you got of the American aircraft trade by visits at the various works of note, you answer quick: "America was at the start of 1917 where Germany was in 1913."

And rather otherwise than grumbling at the difference of three to four years the comparison with Germany should be taken as a compliment. A clever policy of money backing was the keynote to German aviation successes up to the outbreak of war. Now large foreign orders and the establishment on large lines of a national Air Service as the result of an energetic agitation of the American Aero Club have rendered the establishment of the United States aircraft trade on a sound financial basis possible. Where German aviation is to-day ahead is in the refinements, and development from the mutual war competition with the best Allied brains, and this is but a question of time, where Uncle Sam can, from his period of neutrality, afford to pay for tuition, and even get it cheap, if extracting the right lesson from the mistakes committed by the European belligerent countries.

Which is, then, the foundation on which to build up an American aircraft trade? Whether you prefer to give Wright or Curtiss first mention is a question of primogeniture or present leadership. American aviation workmanship was pretty poor before, i.e., up to the last days, maybe, owing to the costly labour of the New World, and here is where the largest progress has taken place. For beyond individual criticism of detail work you can have no objections against the products of the six main pillars of the show, and too of the American aviation industry, namely the aviation firms: Aeromarine, Curtiss, L.W.F., Standard, Thomas, and Wright-Martin. And in letting this row pass review the German allusion turns up again, for not only the conditions of development favour a comparison with Germany, even the appearance of above-mentioned products are distinctly German.

Next to bad construction, the former worst obstacle to progress was apparently the patent controversy, and as America's entry into the war demands now quick settlement, the practical Americans have by bill set a million dollars aside for a money decision of the question, with knowledge where the shoe pinches with a British ante-going procedure of remedy as a model, and with the case simplified by the U.S. Government as only customer.

For well was the policy of the Wright Co. on one side to get handsome royalties from the other aeroplane firms, and even the Curtiss flying-boat patents were here no equivalent, the results being that new companies were hampered in their activities, and the final effect was that the finished product in the end enhanced the amount of the royalty to the chief customer: the Government. But, on the other hand, the Wright Co. adopted too a clever manufacturing policy to enter into competition with the Curtiss concern.

To this end the Wright-Martin Corporation is to-day the owner of a well-combined and well-equipped ring of plants. In the West on the Pacific coast the Glenn L. Martin manufacturing factory, in Dayton the original and experimental Wright works, and on the Atlantic coast the high grade Crane-Simplex automobile works, where the Hispano-Suiza aero-engine is made.

At the show the exhibits included the original Wright biplane of 1903, a Martin Hall-Scott engined tractor biplane, the beautiest finished to be seen there, and a grey Hispano-Suiza engined Wright-Martin biplane, just finished, and not looking all too pleasant in design with its long body. Of motors, the Hispano-Suiza was seen in two editions, the 150 h.p. V type model and a four-cylinder 75 h.p. vertical motor with a single block.

The Curtiss Corporation can not easily be challenged as the world's largest aircraft concern, and both a view of their stands and visits at their works give evidence to the variety of work. Within the range of the limits from the tiny triplane scout, over the battleplane twin-engined Farman type and fuselage type tractors to the Super-America enclosed flying-boats, and within the string of nomenclature of engines, a fair selection was shown, yet the most interesting types, the very latest machines, were worshipped by being withheld from the general inspection of an exhibition, whereas the foremost idea of the "cry" of the stands, a totally enclosed aero limousine, is to be of show attraction, being a combination of the wings from the triplane with the tail longerons of the "Canada" model and with an enclosed light car with tandem seat arrangement, the driver being in front, with two passengers aft, and the 100-h.p. motor situated under the bonnet as in general car practice with a shaft-cum-chain drive of the four-bladed pusher propeller.

Sound work was shown at the stands of the Thomas-Morse Aircraft Corporation and the L.W.F. engineering company, the former's exhibits being a tractor biplane, the 135-h.p. V-type motor and the same type in 150-h.p. sound aluminium edition, the latter firm showing a Thomas-engined biplane with laminated wood fuselage, though the coincidence in initials do not explain away the derivement from the three founders of the company, the one being now chief designer of the Aeromarine firm, Mr. Willard, who claims intimate knowledge of British aviation, since his father invited Mr. A. V. Roe over the pond in ye old days. Following now a steady course, this company produces at its two plants both six and twelve cylinder motors, and exhibited a pleasant lined biplane, shown without engine.

The Standard Aero Corporation, successors to the Sloane Co., showed their biplane to the design of their chief engineer, Mr. Day, being, with its arrow-shaped planes and general robustness, more like a pre-war German product than anything else. Ugly and unpractical is the chimney-like front radiator used for this biplane and other American aircraft too.

The Burgess Co., of boat builder fame, was represented by a Dunne seaplane, and the Benoist company by a not too carefully designed boat, but the rest of the aeroplane exhibits, and thus the Cooper, Pierce, Robin Hood, and Wittemann, belonged to the category of freaks familiar from European ante-war aero-shows, being poor either in design or construction, or both.

Of aero engines, beyond those already mentioned, were the Knox 300-h.p., a fine-looking though somewhat heavy piece of work; the Sturtevant, the two factories bearing this name being only represented by engines; the 150-h.p. and 300-h.p. Duesenberg engines, giving evidence of brain work; the Packard V-type motor, too, having the requirements for developing into a first-class aviation motor; the Roberts two-cycle, the Wisconsin, and a number others, being but single editions of their inventors' ideas.

The accessory department bore evidence to the manufacturers in the automobile line and others being live aware of the possibilities opening in the aircraft field. Foremost the various products of the Sperry company must be mentioned, also the Herbert and Huesgen aerial photography apparatus, developed by Captain Bass, and the Roebling wires. And one could not abstain from thinking that in the intensive work to come in the American aircraft trade an "Aircraft Supplies Co." transplanted on United States ground should turn out of mutual benevolence.

From the American working ideas I will mention one small instance not familiar in European practice, that for lining the sewing over the ribs on the planes a woven cover is employed, as the dope sticks thus better to the cover and prevents it from loosening when getting wet.

Further, I must quote the text of a signboard in the Standard Aero Works: "Workmen! if you spit at home, do so here, too. We want you to feel at home."

And finally, in confessing belonging to one of the few neutral countries left, which means even speaking a non-English tongue, my object is on one side to ask excuse for poor expression, and on the other to thank one and every single, from works managers to the aviation papers' editors and Aero Club officials, for kind attention and hospitality, second to none of the old world—before the war.—H.

The Birth of a Great Seaplane.

By One Who Watched It.

If you have ever watched the launching of an ocean-going liner, you cannot have been insensible to a certain feeling of pride that sways all spectators as the huge shape plunges into its natural element for the first time. So, too, the launching of a great modern seaplane to-day, in all its beauty of form, awakens emotions of pride and satisfaction not only in the breast of its ingenious inventor, but also in the breasts of the workmen-spectators who have all contributed the skill of their hands.

But there are two main distinctions between the ceremonies attending the birth of marine and supermarine craft. The career of a liner is begun under conditions which, if they have not lost their thrill, are, at least, shorn of much of their novelty; and such a launch is a public event of no small local importance. On the other hand, the mammoth seaplane is a recent creation—a product of the war, in fact, that makes its debut under a veil of mystery. Hence, the ceremony of its christening, commonly called the reception test, takes place without the limelight of publicity.

There is, however, plenty of stir for the army of builders and mechanics.

At last, the scaffolding which has hidden the seaplane like a spider in its web, comes down; and we have disclosed to our view a giant bird which is something of a cross between St. George's Dragon and the fighting Martian visualised by H. G. Wells.

Viewing the machine from a high gallery alongside, one may be pardoned for asking, "But will it fly?" That is a question as natural to your mind as is another question put by the inventor, "Will it do its performance?" That, translated into popular parlance, is, "Will it rise off the water in the distance calculated; will it climb up into the air at the rate of —— feet per minute which an exacting Government have stipulated; and will it do a certain lightning speed at a certain altitude up above the clouds?"

A mass of technical factors are involved in these vital questions which this inventor has put to himself almost daily for several months past. He is a rather young-looking fellow, with clever grey eyes and clear-cut features that bespeak a highly-strung but courageous temperament; and by his mixture of genial wit and firmness of command, you feel you can discern in him one of England's foremost aeronautical engineers. His workmen are loyal, obedient, and even affectionate in their devotion; and they feel that while always encouraging their initiative, he is one of those few master-minds who know what they want and will brook no difficulty, technical or departmental.

The great shed that harbours the giant bird has throbbed with excitement the clock round. Naval officers and mechanics seem to be hustling as if the issue of the war depended on their efforts that day. On all sides of The Thing they cling like bees after honey. Heads pop in and out of the fore and aft cabins, tanks are being filled with what seems endless streams of petrol and oil; and then, suddenly, the word goes round that all is ready.

Workmen climb down and stand aside, ladders and other obstructive tackle are moved away, and the small crew proceed to take their seats. The pilot and a Naval officer, who is rather American in aspect but British to the bone, appropriate the two back cockpits.

Four strong men at the winch commence to wind a steel rope, and The Thing, riding on a long, low metal truck or bogey, commences to move slowly along a railway of 20-foot-gauge. In this way the slipway leading to the water's edge is reached.

Then comes a pause. The giant bird, like an animate thing that has now drank in the breath of life, sets up a deafening noise. The engines have started. Cranked by the men on board, they are "ticking round," and the propellers raise a veritable gale for onlookers standing near the tail. The only uncomfortable person, however, is the starboard cranker, who was holding on to the exhaust-pipe to get a firm grip, and found it got hot too quickly.

The monster is let down the slipway till she floats clear of the bogey; and the Chief Pilot assumes undisputed command. He opens the throttle, there is an almost frightening roar, long sheets of white spray are shooting from the sides of the floats. She is off!

The enthusiasm is infectious. The inventor, phlegmatic and austere, is drawn to join in the applause, though his tense features relax but little as yet. He is on the alert to catch a reassuring signal from the pilot who has found the craft so airworthy that he has let go all the controls. His signal is that the machines natural stability, even in a wind, is wonderful.

The waving and shouting and the barking of the foreman's dog continue until the seaplane has risen high in the cloud-flecked sky, and now appears like a silent comet pursuing its dizzy course.

Half an hour of suspense drifts by while we discuss our estimates of the "climb" and speed on even keel. Then the hum of the engines once more becomes audible, and ripens very soon into the old nerve-racking roar. The machine seems to get bigger and bigger as it lowers its altitude, and the next minute sees a safe descent on the choppy sea, and the weather-beaten pilot is "taxi-ing" his charge to the slipway up which it is hauled by the army of enthusiastic workmen.

"How did she behave?" is the question put a hundred times to the leather-jacketed pilot. "Did her climb fine!" "Plenty of power to spare." "A topping 'bus," are fragments of the replies we hear.

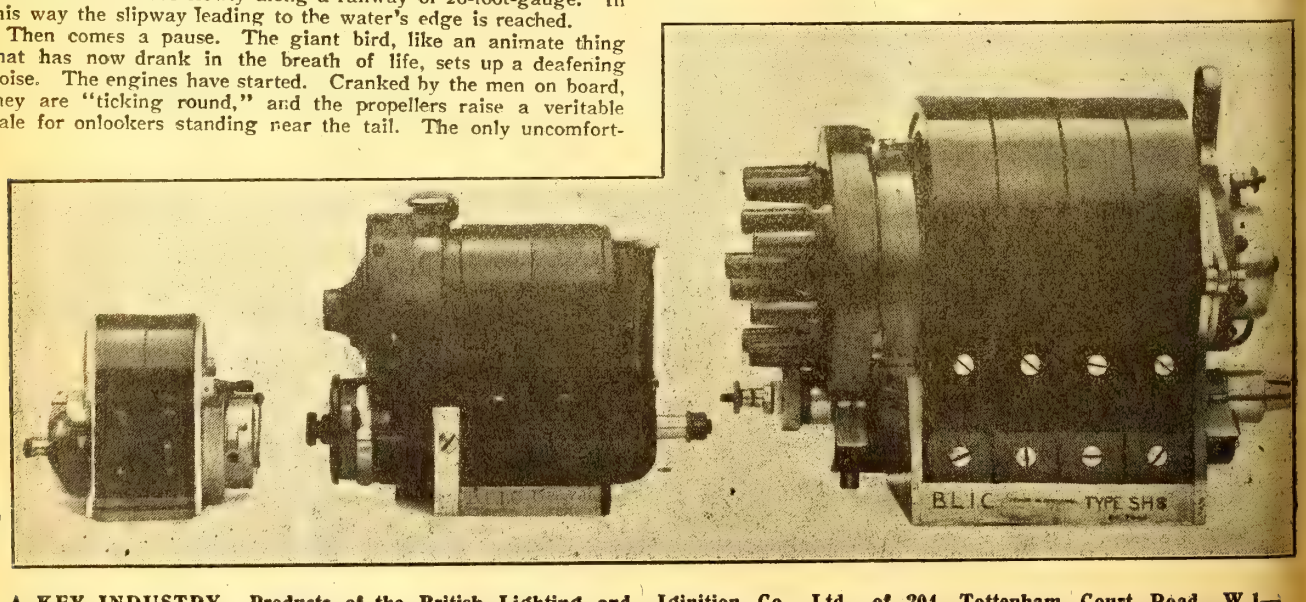
The Naval Inspector is busy making his notes on the speeds attained at different altitudes and the rates of climb, and on other Admiralty secrets; and from the smile that spreads over the now relaxed features of the designer, we gather that the launch and test have even exceeded his own calculations, and that the British nation have received from him a new Hun-strafer of exceptional capacity.

ITALIAN TRADE NOTES.

As if to accentuate the good impression made by them at the recent exhibition, one of the Colombo motors mounted on a Savoia-Farman has been home-record breaking down south. 5970 metres, in full warpaint, as required by the regulations, is said to have been thought a great deal of by those whose business it is to know just what weight was on board the machine.

Among other "accessory" stands with which I hope to deal more fully when space is less rare, I must mention that of the Italian Bowden patents. Practical proofs of its invaluable help in getting power round corners was shown by weight-lifting and other working installations. After the i.c. engine, this patent is about the most useful thing that has happened along for flying people.

The Ansaldo Co. announce that they are going to turn out the biggest thing in the way of seaplanes that Italian genius has been able to devise. Their advert. mentions that the works at Borzoli are the biggest in the world.—T. S. H.



A KEY INDUSTRY.—Products of the British Lighting and Iginition Co., Ltd., of 204, Tottenham Court Road, W.1—commonly known as the Blic. On the left is a light-weight Blic Magneto, motor-cycle type. In the middle is a six-cylinder Blic, for an aero-engine, and on the right is an eight-cylinder Blic, for a stationary engine.

(*Continued from page* 230.)

tacked one, and fired 60 rounds into its cockpit at point-blank range, the enemy machine rolling over and over for 3,000 ft., and then falling vertically out of control. He then attacked another enemy machine, which had dived onto one of our machines from behind, and with the help of a scout he shot it down, the enemy being seen to crash to the ground. Another hostile scout was then attacked by pilot, end-on, and received a long burst at very close range, the enemy going down in a spin, but apparently righting himself lower down. During this last encounter Flt. Comdr. Gerrard's machine was riddled with bullets, but, by fine piloting, he landed safely, although all but his lateral controls were shot away, and his machine damaged to such an extent as to require return to depot for complete rebuilding. This officers has now destroyed at least seven hostile aircraft. He was on active service in France and Belgium from April to September, 1916, and during that period performed much valuable work.

Flt. Comdr. Reginald Frederick Stuart Leslie, R.N.A.S.

In recognition of his gallantry in pursuing hostile raiding aeroplanes out to sea in a land machine on May 25th, 1917. He attacked one hostile aeroplane, and caused it to descend in a steep nose-dive, emitting smoke and steam. He was unable to observe its fate, as he was himself immediately attacked from behind by two other hostile machines and temporarily lost control. When he regained control, the machine which he had first attacked had disappeared, and two others were proceeding eastwards at a considerable height above him. He then returned safely to his aerodrome.

Flt. Lt. Guy Duncan Smith, R.N.A.S.

In recognition of his services in the East Indies and Egypt Seaplane Squadron during the period April 1st, 1916, to March 31st, 1917. During this time he took part in several valuable reconnaissances and bombing flights, obtaining important information, and doing considerable damage to enemy organisations.

Flt. Lt. Raymond Collishaw, R.N.A.S.

In recognition of his services on various occasions, especially the following:—On June 1st, 1917, this officer shot down an Albatros Scout in flames. On June 3rd, 1917, he shot down an Albatros scout in flames. On June 5th, 1917, he shot down a two-Albatros Scout in flames. On June 5th, 1917, he shot down a two-two Albatros Scouts in flames, and killed the pilot in a third. He has displayed great gallantry and skill in all his combats.

Flt. Sub-Lt. Norman Richard Cook, R.N.A.S.

For his services in an air raid on Zeebrugge Mole and hostile shipping, on May 27th, 1917.

Flt. Sub-Lt. Robert Frederick Lea Dickey, R.N.A.S.

Warrt. Officer (2nd Grade), Frank Henry Whitmore, R.N.A.S.

In recognition of his services in the East Indies and Egypt Seaplane Squadron during the period April 1st, 1916, to March 31st, 1917.

* * *

The following awards have also been approved:—

TO RECEIVE THE DISTINGUISHED SERVICE MEDAL.

C.P.O. Mech., 3rd Gr., Frederick Cusden, O.N.F.5011 (Po.); Air Mech., 2nd Cl., Henry Martineau Davis, O.N.F.20254; Air Mech., 1st Cl., Arthur William Goody, O.N.F.12237.

* * *

The following Officers and Men have been mentioned in dispatches:—

Flt. Lt. Edward James Pointer Burling, R.N.A.S.; Flt. Lt. Humphrey de Verd Leigh, R.N.A.S.; Flt. Lt. Frederick Middleton Fox, R.N.A.S.; Flt. Lt. Henry Vernon Worrall, R.N.A.S.; Flt. Lt. Thomas Gordon Mair Stephens, R.N.A.S.; Flt. Lt. John Edward Scott, R.N.A.S.; Flt. Sub-Lt. Rowan Heywood Daly, R.N.A.S.; Lt. William Charles Abbott Meade, R.N.V.R.

* * *

The King has been pleased to approve of the award of the following Medals to Officers and Men for services in action with enemy submarines:—

TO RECEIVE THE DISTINGUISHED SERVICE CROSS.

Flt. Lt. John Edward Alfred Hoare, R.N.A.S.

Flt. Sub-Lt. William Louis Anderson, R.N.A.S.

TO RECEIVE THE CONSPICUOUS GALLANTRY MEDAL.

C.P.O. Mech., 2nd Gr., John Frederick Tadman, O.N. 271984 (Ch.)

For conspicuous gallantry in climbing out on the wing of an aeroplane to plug a leak in the radiator. He remained in this position for a period of 20 minutes, thus enabling the aeroplane to return safely to her base.

TO RECEIVE THE DISTINGUISHED SERVICE MEDAL

Air Mech., 2nd Gr., D. R. Chapman, O.N., F.13487.

* * *

The following Officer is mentioned in dispatches:—

Sqdn. Comdr. Ralph James Jean Hope-Vere, R.N.A.S.

* * *

FOREIGN DECORATIONS.

The following Decorations have been conferred by the Allied Powers on Officers of the British Naval Forces for distinguished services rendered during the war:—

THE QUEEN WITH THE R.F.C.—Her Majesty and General Trenchard, G.O.C. R.F.C. in France. The cowling of the handsome machine on the left will be familiar to students of aviation.

CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

CROIX DE GUERRE.

Flt. Comdr. John D. Newberry, R.N.A.S.; Flt. Comdr. Frank Fowler, D.S.C, R.N.A.S.; Flt. Comdr. Charles C. R. Edwards, D.S.C., R.N.A.S.; Flt. Comdr. Charles D. Booker, D.S.C., R.N.A.S.; Flt. Comdr. Alexander M. Shook, R.N.A.S.; Act. Flt. Comdr. Henry G. Olden, R.N.A.S.; Flt. Lt. George G. MacLennan, R.N.A.S.; Observer Lt. Eric B. C. Betts, R.N.A.S.; Flt. Lt. Robert A. Little, D.S.C., R.N.A.S.; Flt. Lt. John E. Sharman, D.S.C., R.N.A.S.; Lt. Hector A. Furniss, R.N.V.R.; Lt. Russell W. Gow, D.S.C., R.N.V.R.; Flt. Sub-Lt. James A. Glen, R.N.A.S.; Flt. Sub-Lt. Walter E. Flett, D.S.C., R.N.A.S.; Observer Sub-Lt. Charles K. Chase, D.S.C., R.N.A.S.

CONFERRED BY THE KING OF ITALY.

ORDER OF THE CROWN OF ITALY.

OFFICER.

Wing Comdr. Ivon T. Courtney, R.N.A.S. (Capt. and temp. Lt.-Col., R.M.L.I.)

CONFERRED BY THE KING OF BELGIUM.

ORDER OF LEOPOLD.

OFFICIER.

Capt. Charles L. Lambe, D.S.O., R.N.

CHEVALIER.

Wing Comdr. Spenser D. A. Grey, D.S.O., R.N.
Sqdn. Comdr. Edward T. Newton-Clare, D.S.O., R.N.A.S.

WAR OFFICE, July 21st.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Flt. Comdr.—Sec. Lt. (temp. Lt.) F. W. Winterbotham, Yeo., T.F., from a Flying Officer, and to be temp. Capt. while so empld., July 10th.

Equipment Officers, 1st Cl.—Sec. Lt. (temp. Lt.) H. J. C. Smith, Spec. Res., from the 2nd Cl., and to be temp. Capt. whilst so empld., June 1st. 2nd Class.—From the 3rd Cl.—Capt. A. L. Gregory, M.C., Dorset R., Spec. Res., July 1st. And to be temp. Lts. whilst so empld.:—Sec. Lt. T. P. Whitcomb, Essex R., T.F., temp. Sec. Lt. A. S. Poynton, R.E., Sec. Lt. H. Straker, Spec. Res., July 1st; Sec. Lt. C. Lambert, Spec. Res., July 2nd. 3rd Class.—Lt. McRae, Canadian Mil. Forces, May 3rd; Temp. Sec. Lt. (on prob.) R. J. Murchison, Gen. List, and to be confirmed in his rank, June 20th; Temp. Sec. Lt. S. W. Gilbey, A.S.C., and to be transfd. to Gen. List, July 2nd; Temp. Sec. Lt. (on prob.) S. Williamson, Gen. List, and to be confirmed in his rank, July 3rd.

Gen. List.—From R.F.C. to be temp. Sec. Lts., June 26th:—1st Cl. Air Mech. McLeod Neville Staight, 1st Cl. Air Mech. H. G. Toyé, Gnr. P. Seymour, Cpl. S. P. Tigg, 2nd Cl. Air Mech. B. Z. Simpson, Flt.-Sgt. E. C. Robinson, Sgt. H. Haworth. To be temp. Sec. Lts. (on prob.):—J. K. Bell, C. E. Maryon, H. L. B. Buchanan, June 29th; H. Smith, July 12th; Sgt.-Maj. S. G. Williams, from R.F.C., July 4th.

WAR OFFICE, July 23rd.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Staff Officer, 3rd Cl.—(Graded for purposes of pay as a Staff Capt.)—Capt. W. G. M. Crothers, Suff. R., Spec. Res., vice Capt. A. W. A. Harker, R.G.A., June 4th.

MEMORANDUM.—Capt. T. W. C. Carthew, D.S.O., from Bedf. R., Spec. Res., to be temp. Capt., Gen. List, July 24th, with sen. from April 9th, 1910, and to retain the temp. rank of Lt.-Col. while empld. as a Wing Comdr., R.F.C., July 24th.

The undermentioned to be temp. Capts.: Temp. Lt. E. E. Jackson, June 5th, 1917.—Temp. Sec. Lt. C. T. Cleaver, M.C., Gen. List, for duty with R.F.C., July 24th, 1917.

* * *

The following name is added to the list of officers, non-commissioned officers and men recommended for distinguished and gallant services and devotion to duty in the dispatch from the Field-Marshal Commanding-in-Chief, the British Armies in France, dated April 9th, 1917, which was published in the "London Gazettes" dated May 15th, 18th, 22nd, 25th, and 29th, and June 1st, 1917:—

Pashley, Sec. Lt. E. C., R.F.C., Spec. Res. (killed).

FROM THE COURT CIRCULAR.

BUCKINGHAM PALACE, July 18th.

The following Officer had the honour of being received by the King, when His Majesty invested him with the Insignia of Companion of the Order into which he has been admitted:—

THE DISTINGUISHED SERVICE ORDER AND THE DISTINGUISHED SERVICE CROSS.

Squadron Commander Charles Butler, R.N.A.S.

The King then conferred decorations as follows:—

THE DISTINGUISHED SERVICE CROSS.

Squadron Commander Eric Nanson, R.N.
Flight Lieut. Lionel Shoppee, R.N.A.S.
Flight Lieut. Leslie Brown, R.N.A.S.
Flight Lieut. Stewart Dawson, R.N.A.S.

THE MILITARY CROSS.

Lieut. Valentine Baker, R.F.C.
Lieut. J. Belgrave, Oxf. and Bucks L.I. and R.F.C.
Lieut. Richard Fitton, R.F.A., attd. R.F.C.

* * *

BUCKINGHAM PALACE, July 21st.

The King, who was accompanied by Field-Marshal the Duke of Connaught and Admiral the Marquis of Milford Haven, held an Investiture in the Forecourt of the Palace, when he received the "Next-of-Kin" of deceased officers and men, and handed to them the Victoria Crosses which had been awarded in the war to their relatives. The following were present:—

Mr. and Mrs. Albert Ball to receive the Victoria Cross awarded to their son, Captain Albert Ball, late The Sherwood Foresters and R.F.C.

NAVAL.

The following appointments have been made in the Royal Naval Air Service:—

JULY 17th.—Comdr.—E. A. D. Masterman, promoted to Act. Capt., seny. July 14th.

Temp. commissions as Lt. (R.N.V.R.) have been granted to W. G. Chapman and J. K. Hoyle, seny. July 16th.

JULY 19th.—Flt. Lt. (temp.).—S. P. Martin, granted a temp. commission as Lt. (R.N.V.R.), seny. April 1st.

JULY 20th.—Flt. Lt. (Temp.).—L. A. Hervey, promoted to Flt. Comdr. (temp.), seny. June 30th.

Temp. commission as Lt. (R.N.V.R.) have been granted to the following, seny. as stated:—W. H. Clegg, July 16th. J. Chapman, July 17th. W. Pollock, July 18th. J. R. Craig and D. R. Parry-Jones, July 19th.

JULY 23rd.—Temp. commissions as Lt. (R.N.V.R.) have been granted to W. H. Mainprize, B.A., and E. W. Cook, seny. July 19th and 21st.

THE CASUALTY LIST.

Reported July 18th.

KILLED.—Mitchell, W. L., P.O. Mech., F.10045.
DIED OF WOUNDS.—Edwards, W. J., Ldg. Mech., K.10970.

Reported July 19th.

ACCIDENTALLY KILLED.—Bryans, Flt. Sub-Lt. F. M., R.N.
Daly, Flt. Sub-Lt. D. H., R.N.
MISSING.—Bray, Flt. Sub-Lt. F., R.N.
WOUNDED.—Philip, Flt. Sub-Lt. L. A., R.N.
PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Mackenzie, Flt. Comdr. C. R., D.S.O., R.N.

Reported July 20th.

KILLED.—Begg, Flt. Sub-Lt. R. G., R.N.
Planterose, Observer Sub-Lt. E. A., R.N.
ACCIDENTALLY INJURED.—Warne-Browne, Prob. Flt. Officer T. A., R.N.

Reported July 23rd.

KILLED.—Waterlow, Wing Comdr. C. M., R.N.
MISSING.—MacLennan, Actg. Flt. Comdr. George G., R.N.
Akers, Flt. Sub-Lt. Frederick W., R.N.
Kent, Flt. Sub-Lt. Raymond L., R.N.
SLIGHTLY WOUNDED.—Glaisby, Flt. Sub-Lt. Lacey N., R.N.

PERSONAL NOTICES.

DEATHS.

BEGG.—Flt. Sub-Lt. Rivers Gordon Begg, R.N., who was killed on July 17th, was the son of Mr. and Mrs. H. C. Begg, Beechfield, Langley Road, Watford, and formerly of Calcutta.

CROWE.—Flt. Sub-Lt. H. Lawrence Crowe, R.N., whose death on June 22nd in an accident to the machine which he was flying, has already been announced. Mr. Crowe was a son of Mr. and Mrs. Harry Crowe, of Toronto, Canada, was a graduate of St. Andrew's College, Toronto, and qualified for his pilot's certificate at the Curtiss Aviation School, Newport News, Virginia, U.S.A. He was on special patrol duty when he was killed. An officer under whose command he had served writes of him that he had "always cherished a very warm memory of him. . . . The Service has suffered a real loss in this officer. His loss has been a real blow to myself as well as to other officers in the . . . station. . . . I hoped that despite his youth he would soon get promotion."

MACKENZIE.—Flt. Comdr. Colin Roy Mackenzie, D.S.O., R.N. (previously reported missing, now reported killed), was awarded the D.S.O. last October in recognition of his skill and gallantry in destroying a German kite balloon on September 7th, 1916, under very severe anti-aircraft fire.

MORRISON.—Flt. Sub-Lt. Ronald Beckett Morrison, R.N., who was accidentally killed while flying in England on July 12th, at the age of 22, was the only son of Mr. and Mrs. John Morrison, of Dunthorpe, Bickley, Kent. He was educated at Charterhouse, and on leaving there entered the works of an engineering firm. When war was declared he joined the R.N.A.S. as a dispatch rider with the armoured cars, and went to Belgium at the beginning of October, 1914, since when he served continuously in France and Gallipoli until he returned to England in February, 1916.

He was given a commission as Flt. Sub-Lt. in June, 1916, qualified as a pilot, and went out to the front again in December, and remained there until early in July this year, when he returned to take up a home appointment.

ORFEUR.—Observer Sub-Lt. Charles Bernard Orfeur, R.N., who died of wounds on July 1st, was the second son of Mr. and Mrs. Charles E. Orfeur, Colchester. He was in his 26th year.

PLANTEROSE.—Sub-Lt. E. A. Planterose, R.N., killed on July 17th, was the eldest son of Mr. and Mrs. George Planterose, of 8, East Drive, Brighton. He was 24 years of age.

WATERLOW.—All will learn with very deep regret of the death of Lieut.-Colonel Clive Waterlow, R.E. (Wing Comdr., R.N.A.S.), whose death appeared in the Naval casualty list of July 23rd. Clive Waterlow was a Sapper officer fairly fresh from the Shop when he joined the old Balloon Company R.E. in the dim days before there was any flying. He remained faithful to aerostation throughout his subsequent career and took but a casual interest in aviation.

In the Balloon Company he became, in the natural course of events, concerned with airships, and so worked with Major (now General) Capper and the late S. F. Cody on the earliest Army airships. I believe he was, in fact, one of the crew of the famous "Nulli Secundus" in her voyage over London in 1909. Thereafter he was largely responsible for the Army airships which followed. Though not O.C. of the Airship Section of the Air Battalion, R.E., nor of the Airship Squadron, R.F.C., he was, perhaps, the officer most deeply learned in the science and practise of aerostation and as such he was in many ways the moving spirit of the Army airships.

None knew more about the peculiar properties of hydrogen, or the qualities of fabric for envelopes, or the various other things which seem so mysterious to the student of the plain, straightforward aeroplane. At the same time, none could handle an airship better, nor was more skilful in avoiding what seemed likely to be serious accidents.

Perhaps the highest personal tribute paid to the late officer's skill was when he was selected by Captain (now Colonel) Maitland to pilot the little airship from which he made his famous parachute descent into Cove Pond, the first parachute descent ever made from an airship. His skilful handling of an experimental Army airship, the frame of which began to break up in the air, chiefly owing to its having been constructed to the designs of the scientists of the Royal Aircraft Factory, has long been historical among the older airship pilots.

When the Army very foolishly lost interest in airships and handed over its little experimental vessels, with their personnel, to the Navy—with the natural result that they had to borrow balloon experience back again afterwards—Clive Waterlow adhered to his faith in lighter-than-air craft, and transferred with them. Since then he has continued to do work of very high value, both in airship experiments and in the training of personnel, besides finding time in which to deliver a number of most interesting lectures to members and students of the Aeronautical Society on the construction and use of airships.

Apart from his professional duties, Clive Waterlow had many interests and activities. He was an executive musician of considerable ability, and a composer of distinction. For all his knowledge and high technical ability, he had the heart of a child, and children loved him. In his Aldershot days he wrote several fairy plays, which he produced for local charities. These plays were produced entirely by him; he trained the children of the chorus, taught the juvenile principals their parts, wrote the libretto, composed the music, stage-managed the performance, and, I believe, painted the scenery. They were completely successful and very beautiful performances. If he had not been a Sapper officer and an airship enthusiast he might have produced another Peter Pan, and, as it is slightly doubtful still whether Count von Zeppelin or Sir J. M. Barrie is the greater benefactor to humanity, it is likewise doubtful whether Clive Waterlow's work as an airship officer has not interfered with still greater possibilities.

Only on June 9th last Colonel Waterlow was married to Miss Joan Clare, and the deepest sympathy of all will go out to his young widow, a wife for so brief a time. The manner of his death is not officially announced, but one assumes that it happened in connection with an airship experiment of some kind, and doubtless through another person's mistake. His death at the early age of 31—he was born in London on September 9th, 1885—deprives the Army of a notable officer, for though he lost his life in the senior, albeit the minor, Service he remained an officer of that distinguished regiment, the Corps of Royal Engineers.—C. G. G.

Engagements.

BROWNE—CAPPON.—The marriage of Flt. Lt. (acting Lt., R.N.), Chetwode W. C. Browne, R.N., only son of Mr. and Mrs. Willis Browne, The Beeches, Caterham, and Dorothy Janet, younger daughter of the late James Cappon, of Fife, and of Mrs. H. Goodman, Banavie, Caterham, will take place at St. Mary's Church, Caterham, at 2.15 p.m. on Tuesday, August 7th. All friends will be welcome at the church.

MILEY—LEGAL.—The marriage arranged between Sqdn.-Comdr. A. J. Miley, R.N., only surviving son of Dr. and Mrs. Miley, Haven Hill, St. Mary Bourne, Andover, and Mlle. Roberte Legal, youngest daughter of M. and Mme. Legal, Château de Tulock, Guérande, France, will take place at St. George's, Bloomsbury, on Monday, July 30th, at 12 o'clock. All friends will be welcome at the church.

Birth.

CHAPMAN.—On July 13th, at 89, Lancaster Gate, W., the wife of Flt. Lt. C. H. Murray Chapman, R.N., of a daughter (stillborn).

Lt.-Col. Sir H. Montagu Allan, C.V.O., Lady Allan, and Miss Martha Allan wish to thank all their friends in Britain and Canada for the sympathy expressed at the death on active service of Flt. Sub-Lt. Hugh Allan, R.N. They hope, in due course, to acknowledge personally the many letters, telegrams, and cables which they have received.

* * *

The relatives of Flt. Sub-Lieut. R. L. Kent, R.N., who has been missing since July 11th, will be glad if any information concerning him is sent to Mr. Kent, 2, Kelross Road, N.5.

* * *

Flt. Sub-Lt. Bertram A. Trechmann, R.N.A.S., who was officially reported as having died at Constantinople on June 3rd, is now (privately) reported to be well on June 20th, and as having been sent from the hospital in Constantinople to Kutayah in Asia Minor, as a prisoner.

MILITARY.

G.H.Q. Communiqués.

July 17th, 8.58 p.m.—Although handicapped by thick clouds and strong winds, our aeroplanes carried out a great deal of successful work yesterday in conjunction with our artillery, and in addition our raiding machines dropped a large number of bombs on various points of military importance behind the enemy's lines.

In the evening many fights took place in the air, as the result of which six enemy aeroplanes were brought down, one of which was forced to land in our lines, and three others were driven down out of control.

None of our machines is missing.

July 18th, 8.45 p.m.—Owing to the clouds there was little aerial activity yesterday until the evening, when a number of combats took place, in two of which large formations were engaged on each side.

In the course of the fighting eight German aeroplanes were brought down and six others were driven down out of control. Another enemy machine was shot down by our fire from the ground.

Four of our machines are missing.

July 21st, 8.57 p.m.—Four German aerodromes were successfully bombed yesterday by our aeroplanes, and bombs were also dropped on an important enemy railway junction, causing a large explosion.

There was much fighting in the evening. Three hostile machines were brought down and six others were driven down out of control.

Four of our aeroplanes are missing.

July 22nd, 9.5 p.m.—Yesterday, thick haze interfered with activity in the air until the evening, when many fights took place. Two German aeroplanes were brought down by our machines, and four others were driven down out of control. In addition, one German observation balloon was brought down in flames.

One of our aeroplanes is missing.

July 23rd, 9.37 p.m.—Much successful work was accomplished by our aeroplanes in co-operation with our artillery. Over 3 tons of bombs were dropped by us on the enemy's aerodromes, ammunition dumps, and railway sidings, and good results were observed.

Nine German machines were brought down in combat, including one brought down in the sea when endeavouring to return from England, and four other enemy aeroplanes were brought down out of control. In addition, one enemy machine was shot

down out of control by our anti-aircraft guns, and one hostile observation balloon was brought down in flames.

Nine of our aeroplanes are missing.

WAR OFFICE COMMUNIQUÉS.

JULY 19th.—The G.O.C. the British Forces in Macedonia reports:—

There is no change in the situation.

Our aeroplanes have bombed Marinopolje and Vetrina (Upper Struma Valley), Savjak (south of Demir Hissar), and Angista station.

Near Angista a hostile machine was brought down in flames.

JULY 23rd.—The G.O.C. British Forces in Macedonia reports: On the same day our aeroplanes bombed Demir-Hissar and the neighbouring village of Puljovo (Struma front).

HOME COMMAND COMMUNIQUÉS.

JULY 22nd.—11 a.m.—A squadron of enemy aeroplanes variously reported at from 15 to 21 in number, approached Felixstowe and Harwich at 8 a.m. this morning.

Some bombs were dropped, but the heavy fire from the anti-aircraft defences caused the enemy formation to split up, part returning overseas, and part proceeding south down the Essex coast.

The latter party were heavily engaged by gunfire all down the Essex coast, and finally proceeded homeward without dropping any more bombs.

The raiders were pursued out to sea and heavily engaged by our own aeroplanes, but visibility was low, and difficulties of observation very great.

Reports of casualties from Felixstowe and Harwich so far are as follows:—

Killed 8. Injured 25.

6.30 p.m.—Since the issue of this morning's communiqué three more deaths and one further case of injury have been reported. The total casualties thus amount to:—

Killed 11. Injured 26.

Only insignificant damage to property was caused.

A patrol of the Royal Flying Corps encountered some of the hostile machines returning to Belgium, and succeeded in bringing down one of the raiding aeroplanes, which fell into the sea not far from the coast.

THE CASUALTY LIST.

Reported July 18th.

WOUNDED.—Alston, Sec. Lt. C. R., R.F.C.
Dudbridge, Sec. Lt. M., R.F.C.
MISSING.—Battersby, Lt. P. W., Yeo. and R.F.C.
Crafter, Lt., M.C., Lond. R. and R.F.C.
MacGown, Lt. J. C., Yeo. and R.F.C.
DIED.—R.F.C.—Hutchison, 44754 2nd Cl. Air Mech. C. J. (Belgrave Road, Slough).
AUSTRALIAN FORCE.—DIED.—Wakely, 1046 A. W. C.

Reported July 19th.

KILLED.—Orr, Capt. R. B., A. and S. High. and R.F.C.
Thunder, Sec. Lt. M. H., R.F.C.
WOUNDED.—Holme, Capt. R. C. L., M.C., Som. L.I., attd. R.F.C.
Powell, Capt. H. S., M.C., R.F.C.
MISSING.—Brooks, Capt. E. A., Wilts. R., attd. R.F.C.
O'Dwyer, Capt. J. E. A., Sher. For., attd. R.F.C.
PRISONER IN GERMAN HANDS.—Lee, Lt. A. C., R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Grout, Lt. E. J., R.F.C.
Osborn, Sec. Lt. C. C. F., R.F.C.
KILLED.—R.F.C.—Matthews, 2012 Flt. Sgt. F. G. (Cheltenham).
AUSTRALIAN FORCE.—MISSING.—Norvill, Lt. V. A., F.C.

Reported on July 20th.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Bennie, Sec. Lt. R. S., R.F.C.
Foster, Sec. Lt. F. H., R.F.C.
Haller, Sec. Lt. E. D., R.F.C.
Paton, Sec. Lt. H. F., R.F.C.
Philip, Sec. Lt. E. T., R.F.A., attd. R.F.C.
Milliship, Sec. Lt. W. G., R.F.C.
Robertson, Sec. Lt. A. G., Black Watch, attd. R.F.C.
Thayre, Capt. F. J. H., M.C., R.F.C.
DIED OF WOUNDS.—Pearson, Lt. F. G., R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED OF WOUNDS.—Garnett, Lt. W. P., R. Berks., attd. R.F.C.
WOUNDED.—Cross, Sec. Lt. J., R.W. Kent, attd. R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS OF WAR IN GERMAN HANDS.—Gilchrist, Sec. Lt. W., Rifle Brigade, attd. R.F.C.
Holman, Sec. Lt. L., Hussars, attd. R.F.C.
Mussared, Sec. Lt. W. J., R.F.C.
O'Brien, Lt. C. R., K.O. (R. Lancaster), attd. R.F.C.
Sharpe, Sec. Lt. F., Sherwood Foresters, attd. R.F.C.
Slee, Sec. Lt. F. D., R.F.C.
Stead, Sec. Lt. G. O., R.F.C.
CANADIAN CONTINGENT.—KILLED.—Binkley, Lt. B. W., Saskatchewan, attd. R.F.C.
Osborne, Capt. H. P., New Brunswick, attd. R.F.C.
PREVIOUSLY REPORTED ACCIDENTALLY KILLED, NOW REPORTED KILLED.—Wheatley, Lt. L. A., Saskatchewan, attd. R.F.C.
ACCIDENTALLY KILLED.—Hanson, Lt. J. C., New Brunswick, attd. R.F.C.
WOUNDED.—Chester, Lt. W. M. E., Central Ontario, attd. R.F.C.
Le Royer, Capt. J. A., Quebec, attd. R.F.C.
MISSING.—Fotheringham, Lt. J. B., Quebec, attd. R.F.C.
Snyder, Lt. F. C. H., W. Ontario, attd. R.F.C.

Reported on July 21st.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—McArthur, Capt. L. W., M.C., H.A.C. and R.F.C.
WOUNDED.—Buschmann, Sec. Lt. A. K A. M., Mx. R., attd. R.F.C.
Gopsill, Capt. K. L., E. Surr. R., attd. R.F.C.
Money-Kyrle, Sec. Lt. R. E., R.F.C.
Sargant, Sec. Lt. F. H. St. C., R.F.C.
Scott, Maj. A. J. L., M.C., Yeo. and R.F.C.
Turnbull, Sec. Lt. J. S., Worc. R., attd. R.F.C.
MISSING.—Cruikshank, Sec. Lt. K. G., R.F.C.
Fleming, Sec. Lt. J. W., R.F.C.
Griffith, Sec. Lt. J. C., R.F.C.
Robertson, Capt. C. E., R.F.C.
Strickland, Sec. Lt. W. A., Mx. R., attd. R.F.C.
Trattles, Sec. Lt. R., R.F.C.
Whytehead, Sec. Lt. H. H., R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Crisp, Sec. Lt. A. E., Norfolk R. and R.F.C.

CORRECTION.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Sharpe, Sec. Lt. F., Sher. For., attd. R.F.C., should read:—Sharpe, Lt. F., Sher. For., attd. R.F.C.

Reported on July 23rd.

KILLED.—Bishop, Sec. Lt. F. E., R.F.C.
Campbell, Lt. W., R.F.A., attd. R.F.C.
Churcher, Sec. Lt. E., Rifle Brigade, attd. R.F.C.
Creasey, Sec. Lt. A. A., Bedfordshire, attd. R.F.C.
Cunnell, Capt. D. C., Hampshire and R.F.C.
Ellis, Sec. Lt. G. S., R.F.C.
Foreman, Sec. Lt. G. W., R.F.C.
MacFarlane, Sec. Lt. H. E., R.F.C.
WOUNDED.—Birch, Sec. Lt. W., R.F.C.
Broadberry, Capt. E. W., Essex and R.F.C.
Court, Sec. Lt. F. P. M., R.F.C.
Jones, Sec. Lt. B. C., R.F.C.
Logan, Sec. Lt. D., Arg. and Suth. Highrs., attd. R.F.C.
MacLanachan, Sec. Lt. W., R.F.C.
Nutkins, Lt. V. W., R. Scots Fus., and R.F.C.
Osman, Sec. Lt. L. W., R.F.C.
Palethorpe, Capt. J., M.C., R.F.C.
Willmott, Lt. S., R.F.A., attd. R.F.C.
MISSING.—Baumann, Sec. Lt. M. O., R.F.C.
De Rochie, Sec. Lt. C. M., R.F.C.
Hudson, Capt. F. N., M.C., Buffs (E. Kent), attd. R.F.C.
Lewis, Sec. Lt. H. M., Welsh, attd. R.F.C.
Matheson, Lt. A. P., R.F.C.
Mathew, Lt. C. G., R.F.C.
Miller, Lt. A. W. B., K.O. Sco. Brdrs., attd. R.F.C.
Oliver, Sec. Lt. F. L., Som. L.I., attd. R.F.C.
Palmer, Sec. Lt. G. H., R.F.C.
Savoury, Sec. Lt. A. J., Yeomanry and R.F.C.
Smith, Sec. Lt. T. E., R.F.C.
CORRECTION.—MISSING.—Goods, Lt. G. M., R.F.C., should read Goode.
CANADIAN CONTINGENT.—MISSING.—Sliter, Lt. E. D., Railway Troops, attd. R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR IN GERMAN HANDS.—Hunter, Lt. G. D., Central Ontario, attd. R.F.C.

Reported July 24th.

MISSING.—Winterbotham, Lt. F. W., Yeo. and R.F.C.
INDIAN FORCES.—WOUNDED.—Buchanan, Sec. Lt. D. S., R. of O., attd. R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED WOUNDED AND PRISONER IN GERMAN HANDS.—Dickinson, Capt. T. M., Cav., attd. R.F.C.
DIED OF WOUNDS.—R.F.C.—Brown, 7913 2nd Cl. Air Mech. C. (Camden Town, N.W.).
Bundock, 6657 1st Cl. Air Mech. V. (Southend-on-Sea).
Rudd, 49099 Sgt. P. (Bolton).

PERSONAL NOTICES.

DEATHS.

CAYFORD.—Sec. Lt. George Everett Cayford, R.F.C., accidentally killed whilst flying on July 16th, was the only son of Mr. and Mrs. E. Geo. Cayford, of The Mall, Wanstead. He was educated at Bancrofts Schools, Wanstead, and was apprenticed to Messrs. Broom and Wade, Ltd., Admiralty engineers, etc., of High Wycombe. Upon completing his indentures, he joined the Artist Rifles O.T.C., in February, 1916, and later received a commission in the R.F.C. He was very popular throughout the squadron to which he was attached, and greatly esteemed by numerous friends. He was 21 years of age.

JAKINS.—Sec. Lt. Walter Vosper Jakins, whose death in a flying accident was noted last week, had been a keen student of aviation for many years. When a boy at school he wrote an unusually well-informed book on flying, for private circulation, and kept in the closest touch with later developments thereafter, At the beginning of the war, being barely 18 years of age, he enlisted in the Sappers, and despite his youth quickly became an N.C.O. Last year he was transferred to a Cadet Battalion R.F.C., and duly qualified for a commission. His knowledge of flying led to his being made a flying instructor in a very short time, and in that capacity he did excellent work, and was, one gathers, Acting Flight Commander at the time of his death.

His senior officers, wherever he served, acknowledged his worth and ability, and he was universally popular with his juniors. Combining as he did a ready wit with intense keenness for the soldier's profession he was evidently marked for a distinguished career, had he survived. He was a typical example of the best class of British officer, of the kind who made the old British Army what it was, and his early death deprives the King's Service of a most promising member.

LITTLER.—Sec. Lt. Tom Littler, R.F.C., was the only child of Mr. and Mrs. John Littler, of Simla, Brixham. He was killed in an aerial action on July 3rd, aged 19. He was educated at Paignton College, and after some experience at the engineering works of the Great Western Railway Company, Swindon, joined the Artists Rifles O.T.C. in November, 1916, and transferred to the R.F.C. as a cadet last March. He obtained his commission on April 12th and his "wings" on May 18th. At the time of his death he had been three weeks at the front. Letters received point to his general popularity. "A stout-hearted and very gallant boy, always ready for his job," his squadron commander writes.

MACFARLANE.—Sec. Lt. Harold Embleton Macfarlane, R.F.C., who was killed in action on July 14th, was the son of Harold and Elizabeth Macfarlane, Baysgarth, Northwood. He was 18 years of age.

MIDDLETON.—Lieut. J. R. Middleton, R.F.C., eldest son of the late G. H. Middleton and Mrs. Middleton, 38, Inverleith Place, Edinburgh, and Mansfield, Strathmiglo, Fife, was born in Canada in 1888. He was educated in Natal and at Edinburgh Academy and University. In 1906 he joined the Canadian Pacific Railway Engineering Staff, where he was engaged as resident engineer on large bridge work in British Columbia when war broke out.

At once joining Strathcona's Horse, he served in France with that regiment, then as lieutenant in the 7th Cameron Highlanders. In 1916 he joined the Royal Flying Corps, and was with his squadron when heavily attacked on March 24th. His machine was forced down in the German lines, and as a wounded prisoner Mr. Middleton was sent to Mulheim Ruhr-hospital, where, a wire from the Red Cross, Geneva, says, he died on June 21st.

His younger brother, Lieut. A. S. Middleton, 1st Cameron Highlanders, died in Rouen in 1916, from wounds received in the battle of Loos.

PITTMAN.—Lt. Cecil Frederick Pittman, B.Sc.Eng., London, R.F.C., who was killed while flying in England on July 20th, was the elder son of Mr. Frederick John Pittman, of Beechcroft, Croydon. He was 26 years of age.

SMEETH. — Sec. Lt. William Sutton Smeeth, Royal Irish Rifles and R.F.C., who was accidentally killed on July 17th, was the eldest son of Mr. and Mrs. J. Watson Smeeth, The Sycamores, Ben Rhydding. He was 22 years of age.

STEVENS.—Sec. Lieut. John Michael (Jack) Stevens, R.F.C., died on July 14th while undergoing an operation at the New Zealand Stationary Hospital, France, owing to wounds received in action. He was the eldest son of the late J. M. Stevens, and Mrs. Stevens, of Sydney and Hazelbrook, N.S.W., and 8, Sellous Avenue, Harlesden, N.W. He was 17 years and 10 months of age. A solemn requiem mass will be sung at the Church of Our Lady at Willesden on the 27th inst., at 10 a.m.

TATHAM.—Sec. Lt. Ion Mordaunt Tatham, R.F.C., whose death in a flying accident with Capt. Van Goetham was announced last week, was the beloved third son of Mr. and Mrs. Charles Tatham, of Greytown, Natal. He was 19 years of age.

THOMSON.—Sec. Lt. W. J. Thomson, R.F.C., who was killed on June 6th as the result of a flying accident in England, was the only son of W. B. Thomson, of Wynberg, Cape Town, the old Blackheath and International three-quarter of the nineties. He joined the London Rifle Brigade at 17 years of age, and after two years' training, as he was not sent abroad, he transferred to the R.F.C., and had only been flying for one month when he was killed. He was a keen athlete, and a member of the Bedford Modern School Fifteen, and was regarded as having the making of a good pilot.

TOPHAM.—Sec. Lieut. Michael Topham, R.F.C. (reported missing on April 13th, now officially believed killed on that date), was scholar of Downing College, Cambridge. He was 21 years of age, and eldest son of Mr. F. D. Topham, of Tonbridge, formerly of the M.S.M. Railway, India. He entered the Service in August, 1916, and had his "wings" in February of this year.

YOUNG.—Sec. Lt. John Edward Rostron Young, R.F.C., whose death was announced last week, joined the Artists Rifles in June 1916, and received his commission in the R.F.C. last February. His major stated that he had absolutely the heart of a lion, and was a very good pilot, that he could not speak too highly of the lieutenant's magnificent behaviour, and that he was proud to think he was in his command. Mr. Young was the fourth son of Mr. William S. Young, of 76, Mitcham Lane, Streatham, and of the late Mrs. Young, and grandson of the late Mr. J. S. Young, of Abbot Hall, Kents Bank, North Lancashire, and nephew of the late Lt.-Col. R. R. Young, 2nd Black Watch, and of Major T. S. Young, retired, I.A., and late 10th Suffolk Regt. He was educated at Streatham Grammar School, and before joining was with the British Bank of Northern Commerce.

ENGAGEMENTS.

DICKINSON—WAUCHOPE.—A marriage has been arranged, and will take place as soon as leave permits, between Capt. C. J. Dickinson, R.F.C., elder son of Mr. and Mrs. W. R. Dickinson, of Gayles, West Wickham, Kent, and Janet Caroline Sutherland, daughter of Maj. C. J. Wauchope, Argyll and Sutherland Highlanders, and Mrs. Wauchope.

FAULKNER—WALTON.—An engagement is announced between Lt. A. G. C. Wallis Faulkner, R.F.C., only son of Arundell C. Faulkner, of Winnipeg, Canada, and grandson of the late Colonel H. D. Faulkner, 2nd Madras Infantry, and Mrs. Faulkner, 6, Netherton Grove, Chelsea, and Morna Grace, younger daughter of the late Sir John Lawson Walton, K.C., M.P., Attorney-General, and Lady Lawson Walton, of Coombe Hill, Butler's Cross, Bucks.

LANGLEY—LODGE.—The marriage between Miss Lorna Lodge and Mr. Robert Langley, R.F.C., will take place at St. George's, Edgbaston, at 11.45 on Saturday, July 28th. There will be no reception, but all friends will be welcome at the church.

SMITH—BIRKETT.—A marriage has been arranged, and will shortly take place, between the Hon. Constantine Smith, R.F.C., younger son of Lord and Lady Colwyn, Colwyn Bay, and Marjorie Methwold, third daughter of Mr. and Mrs. Arthur Birkett, 22, Warwick Gardens, Kensington.

MARRIAGES.

BALLARD—HILL.—At Holborn, by licence, on July 7th, Lieut. Maurice Ballard, R.F.C., only son of Mr. and Mrs. William Ballard, of Rorton, Herts, was married to Beatrice Gunton, the only daughter of Mr. and Mrs. Arthur Hill, of Stapleton Road, Balham, London, S.W.

GRIFFITH—BAILEY.—On July 11th, at the Church of the Annunciation, Bryanston Square, W., Lieut. Alfred Thomas Griffith, R.F.C., youngest son of John Griffith, of Hampden Park, Eastbourne, was married to Edith Marie, only daughter of Mr. and Mrs. John Bailey, of Gerrards Cross, Bucks, by the Rev. Bernard Shaw.

BIRTH.

DISNEY.—On July 9th, at Heronsgate, Herts, Kathleen, wife of Capt. H. A. P. Disney, 1st Cambridgeshire Regt. and R.F.C., of a son.

The promotion of Brigadier-General Brancker, Deputy Director General of Military Aeronautics, to be temporary Major-General, will afford keen satisfaction to those who recognise the excellent work he has done in effecting such a remarkable increase in both the size and efficiency of the R.F.C. simultaneously. Despite all sorts of difficulties and hindrances, and despite the admitted shortage of machines and engines, the training of the R.F.C. at home has increased in intensity to an astonishing extent, with the result that the young pilot with three months' experience now knows more than one with twelve months' flying to his credit knew a year ago. At the same time the number of pilots has multiplied many times over.

Concurrently, the supply of aeroplanes and engines has been pushed forward, and great progress has been made in spite of

the technical errors of the past—and present. General Brancker's personal experience as a pilot, his mechanical knowledge as a gunner officer, and his excellent choice of men—as exemplified by his appointments to home training and home defence commands, and to staff jobs—have been largely responsible for the great improvements which have taken place of late.

Because of these improvements, General Trenchaard's very able work in France has been made possible, and one hopes to see such action taken by the Air Board as will bring to full fruition the magnificent preliminary efforts in aerial war of the R.F.C. under these distinguished officers.

* * *

The appointment of Colonel E. M. Maitland, Essex Regt. (and Wing Capt., R.N.A.S.), to be a Companion of the Distinguished Service Order, will be heartily welcomed by those who have served with him in the Army. Although an aeroplane pilot, Captain Maitland, as he then was, recognised the potential value of airships to the Services and devoted himself to their development.

Both as an organiser and as an experimenter he has done work of immense value to both Services, for besides his airship work he was one of the chief instruments in bringing the kite-balloon into the Navy and Army alike. He formed, equipped, and trained the first K.B. sections—with the able assistance of Squadron-Commander Harry DelaCombe, R.N.—and many of those sections were taken over bodily by the R.F.C., despite the fact that K.Bs. had been thoroughly condemned and contemned by R.F.C. authorities only a little while before.

He was the first person in the world to leave an airship by parachute, and he has done much to develop the parachutes which are now used so successfully, and with so much effect as life-savers, by our airship and kite-balloon officers. Doubtless in time it will be thought worth while to develop parachutes also for aeroplanes, and when that time comes Colonel Maitland's experience will be of enhanced value.

The airships of to-day owe much of their success to Colonel Maitland, and in his present post he will certainly prevent many mistakes which would otherwise occur. There is a certain humour in the fact that, despite the handing-over of all lighter-than-air craft to the Navy, the success of our airships and balloons should be so largely due to soldiers like Colonel Maitland and the late Colonel Waterlow.

The relatives of Capt. Alex. Jennings, R.F.A., attached R.F.C., and of Lt. J. H. Muir, R.F.C., will be glad to receive any information concerning the fate of these officers, who were both reported missing on April 7th. Any information respecting either officer should be addressed to Mr. W. I. Jennings, Kennington Hall, Ashford, Kent.

FRANCE.

OFFICIAL COMMUNIQUÉS.

JULY 18th.—ARMY OF THE ORIENT.—British aviators bombarded the station of Angista (Struma front).

JULY 20th.—ARMY OF THE ORIENT.—British aviators dropped bombs on the enemy depots at Petric (Bulgaria, Strumnitza Valley), causing fires. There were patrol encounters in the Vardar sector. The enemy artillery was active in the region of Monastir.

JULY 21st.—Between July 11th and 20th five enemy aeroplanes were brought down by our pilots, and in addition 11 hostile machines were driven down out of control in their own lines.

ARMY OF THE ORIENT.—British aviators, continuing a series of successful bombardments, caused fires in enemy stores and depots at Porna and Dedeli (north of Lake Doiran). There were patrol encounters and artillery activity in the region of the Vardar.

British aviators have bombarded the motor-car park at Demir-hissar (Struma front). During the day's air fights two enemy machines were brought down.

GERMANY.

OFFICIAL COMMUNIQUÉS.

JULY 17th.—In addition to five aeroplanes, four enemy captive balloons were brought down by our aviators.

The following communiqué has been issued by the Chief of the Naval Staff in Berlin:—

JULY 17th.—During the forenoon on July 14th our naval seaplanes near the Hoofden Bank (off the Scheldt estuary) attacked a number of merchant vessels escorted by destroyers.

It was definitely observed that two destroyers were struck by two direct bomb hits each. One lighter was also struck.

JULY 23rd.—Our captive balloons, which are indispensable for directing artillery fighting, were, along the whole front, the object of futile enemy long-range fire. East of Ypres, they were also made the object of a combined attack by several aerial squadrons. Our battle aviators and anti-aircraft guns rendered these aerial attacks abortive. The captive balloons were undamaged. Eight enemy aeroplanes were shot down.

One of our aerial squadrons yesterday morning dropped bombs on Harwich on the east coast of England, with visibly good effect. The aeroplanes returned complete in number.

[This does not agree with the Home Command communiqué of July 22nd.—Ed.]

RUSSIA.

A message from Petrograd dated July 22nd states that soldiers in the trenches last Monday, prior to the Petrograd rioting, received bulletins from German aeroplanes stating:—

"Members of the Russian Provisional Government have been arrested. There has been rioting in the city. No use your fighting."

ITALY.

OFFICIAL COMMUNIQUÉS.

JULY 17th.—Three Austrian machines were brought down by Lieut. Ruffo (his 10th victory), Sgt. Rizzotti (3rd victory), and Sgt. Allassio. Successful raids were made on Pola and Durazzo.

JULY 18th.—Aerial activity was considerable along the whole front. Two enemy machines were brought down by our aviators; one fell east of Mt. S. Daniele (Carso), and the other at Lom (south of Tolmino). One of our aeroplanes was obliged to land within our own lines.

JULY 19th.—The aerial activity was intense along the whole of the front. One enemy machine was brought down in an air engagement, and fell near Asiago.

JULY 21st.—On the Julian front one of our gallant aviators attacked a squadron of five enemy machines above Oppacchiasella (Carso), bringing down two, one of which fell in flames in our lines.

JULY 23rd.—Last night, notwithstanding difficult atmospheric conditions and the enemy's defence, our aeroplanes effectively bombed enemy batteries on Mt. Hermada (Southern Carso) and the railway works on the Opcina-Gabrovica line (near Trieste).

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It was reported from Rome on July 19th that, in retaliation for the air raids by Austrians on Avlona, an Italian squadron of 21 aeroplanes, on the 16th bombarded enemy positions in Albania, while 18 seaplanes dropped two tons of high explosives over Durazzo, wrecking hangars, quays, and other defensive works. Three large machines shelled the camp at Berat, killing many of the troops and destroying stores and war material. All the machines returned safely.

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It is reported from Milan that on July 19th the Aviation Mission of the American Government visited large aviation camps and works. Many of Italy's picked aviators gave a display of their skill. The American Chamber of Commerce entertained the distinguished visitors to lunch, and among the more noted people present were Major Bolling, Signor Caproni, the famous designer, and his brother, Dr. Caproni, with the popular American Consul, Mr. John Grout.

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An "Authority" tells me that by the end of the war, even if this should occur prematurely, the air maps to India will be ready. Mr. Holt Thomas' lecture has made a most useful mark here, commented by the more intelligent papers.

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The death of Colonel Piazza at the early age of 46, from illness contracted at the front, where he was in command of a regiment of Field Artillery, means a loss not easily summed up in words. The first, with Gavotti, Moizo, and that small elect company, to fly in war conditions, he leaves a vast work of organisation and invention bearing and to bear fruit.—T. S. H.

HOLLAND.

As a result of communications received from the Netherlands Government a further inquiry has been held into the dropping of bombs on Zierikzee, Schouven Island, last April. Fragments of the bombs dropped were produced, and after careful consideration the British Government have accepted the view that the bombs were dropped by a British airman under the bona-fide impression that he was over German-occupied territory.

His Majesty's Government have expressed their profound regret at the deplorable mistake, have assured the Netherlands Government that every possible precaution always has been and will continue to be taken to prevent such occurrences, and have expressed their willingness to pay compensation for the damage.

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It was reported from Rotterdam on July 23rd that the Dutch steamship "Gelderland" was stopped this morning by a German seaplane under the eyes of the Hook of Holland coastguard. The Germans put an officer on board and took the ship to Zeebrugge.

U.S.A.

A message from New York states that the Senate also adopted on July 21st the House Bill appropriating £128,000,000 for aviation. The measure now goes to the President for signature, when it will become operative. Details as to how the money will be spent have not been officially announced, but the Bill is drawn with the object of providing sufficient money for 22,000 aeroplanes and 100,000 men.

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What the American aeronautical press calls a "recruiting station" for the Royal Flying Corps, has been opened at 435, Fifth Avenue, New York, under the command of Captain G. H. Bonnell, R.F.A. and R.F.C. Apparently Captain Bonnell is selecting British and Canadian public school men for appointments as cadets to be trained at Toronto.

AIRCRAFT IN THE HOUSE.

On July 17th, **Mr. Macpherson,** answering **Mr. Billing,** said the enemy aircraft on July 7th did not return from this country "unchallenged and unchecked." Details of the number of hostile machines which were brought down had already been announced. No military inquiry had been held into the circumstances of the raid, but, as was always the case, the preparations to meet it and the action taken had been carefully investigated with a view to improving the defence arrangements.

Mr. Hogge asked whether the machines brought down in the North Sea were part of the fleet which reached London? **Mr. Macpherson**: I must have notice of that.

Mr. Pemberton-Billing asked how many British pilots were killed or injured and how many British machines were smashed either by the enemy, or by forced landings, or otherwise during the air raid on July 7th.

Mr. Macpherson: Two pilots were killed in action. One pilot was wounded; one observer died of wounds. Two aeroplanes were destroyed by the enemy. Two aeroplanes crashed from other causes.

On July 18th **Dr. Macnamara,** replying to **Sir H. Dalziel,** who asked whether members of the Royal Naval Air Service were allowed to go up and attack enemy aeroplanes whilst flying over land or only over the sea, said: The Royal Naval Air Service work in the closest co-operation with the Royal Flying Corps in regard to home defence, and invariably attack enemy aircraft whenever and wherever seen.

Mr. Macpherson, in answer to **Sir H. Dalziel,** said the Royal Flying Corps were allowed to attack enemy aircraft over land or sea. **Colonel C. Lowther**: Is the hon. gentleman satisfied that sufficient cohesion exists between the naval and the land air services? **Mr. Macpherson**: Yes, I am.

[Mr. Macpherson might investigate further.—Ed.]

Mr. Macpherson (Ross and Cromarty, L.), asked by **Mr. Lynch** (Clare, W., Nat.) whether the aeroplanes that escorted Princess Mary on her journey to Southend-on-Sea were fighting aeroplanes, said: I am informed that H.R.H. the Princess Mary was not escorted by any aeroplanes of the Royal Flying Corps.

Mr. Lynch: Can the hon. gentleman account for the fact that all the London newspapers stated that she was? (Cries of "Oh!")

Major Baird (Rugby, U.), asked by **Major Kerr-Smiley** (Antrim, N., U.) whether a large number of aeroplanes had recently been out of action owing to the lack of spare parts, whether the manufacturers were instructed to supply a sufficient number of spare parts for every machine made, and who was responsible for deciding that the proportion of spare parts was requisite and for seeing that such a proportion was consistently maintained, said: The answer to the first and second parts of the question is in the affirmative. As regards the third part of the question, the proportion of spare parts per machine is decided by the two Services, who prepare the schedule referred to. Additional spares required for the further maintenance of machines beyond the original spares are ordered by the Supply Department on receipt of requisitions from the Services.

[Mr. Macpherson might do well to inquire why certain firms have been refused orders recently on the grounds that we have all the aeroplanes and parts which we require.—Ed.]

In answer to a further question, **Major Baird** added that everything was being done to remedy the present position.

On July 19th, **Major Baird,** answering **Sir H. Dalziel,** said: More aircraft could, no doubt, be used if they could be produced. The fullest use is being made of manufacturing facilities, and increased orders have been placed with those firms which are in a position to execute them.

[Then why have orders recently been refused to firms which can make aeroplanes?—Ed.]

Mr. Watt (Glasgow, College, L.): Is it not the case that some aeroplane factories have been closed down for want of orders? **Major Baird**: It is not possible to judge the question on those lines. There are two things which have to be balanced—aeroplanes and engines; and it often happens that some shop has to go short because of some parts from others not coming in time.

[When is the Government Enquiry into Engine Supplies going to take place?—Ed.]

AMERICAN WOOD.

Sir H. Dalziel asked the Minister of Munitions whether any complaints have been received from aeroplane manufacturers concerning the quality of recent Government purchases in Seattle, United States of America, of silver spruce used in the construction of aeroplanes; and whether he is aware that there were no complaints of this kind when purchases were made through private traders? **Sir W. Evans**: No, Sir. The timber which is now being supplied to contractors is the best available.

AIRCRAFT ENGINES (OUTPUT).

Mr. Peto asked the Minister of Munitions whether he is satisfied that no increase of output of aircraft engines would be possible if the fundamental principle of rivalry in quality and quantity of the finished product were applied wherever companies could be equipped to turn out the completed engine; and, if so, whether he will take steps to apply this principle at once? **Sir W. Evans**: The principle of rivalry is adopted in respect to design only. Once a design has been adopted, quality is adequately ensured by the present method of inspection. The manufacture of the same engine by various firms would not necessarily increase the output, and in the case of most engines the total possible output would be diminished, as compared with concentration on one firm, especially where it involved providing special facilities, organisation and tools.

Mr. Billing: Are not the reasons for delaying the output of engines because approved designs are altered by the official experts? **Sir W. Evans**: No; I do not agree.

Mr. Peto asked the Minister of Munitions whether, in the placing of orders for the construction of aircraft engines, orders have been divided into component parts on account of patent rights held by companies for the construction of some essential parts; and whether his Department will inquire whether the output could be accelerated if in any case where orders for parts only are at present placed with any company orders were placed for complete engines? **Sir W. Evans**: The placing of orders for parts of aircraft engines is arranged with a view to expedition in delivery, and the existence of patent rights is not taken into consideration in the placing of such orders. Whether orders are placed for complete engines or for parts depends entirely on the existing or potential capabilities of the plant of the manufacturing firm.

Mr. Billing: Would the hon. gentleman consider the advisability of cancelling all those orders for parts which have been given for engines which themselves are already cancelled? **Sir W. Evans**: I do not think my hon. friend can point to any such instance; if he can, I shall be obliged if he will let me know.

Mr. Billing: I shall do so.

Mr. Peto asked the Minister of Munitions whether all patent rights over the manufacture of aircraft engines or any other essentials of war have been without restriction placed at the service of the Government; and, if not, whether he will see that immediate steps are taken to place the Government in complete and unfettered control of all these rights for the prosecution of the war? **Sir W. Evans**: The Government has full powers over all patent rights under Section 29 of the Patents and Designs Act, 1907, and full power under Regulation 8/cc of the Defence of

the Realm Regulations to enforce the disclosure of secret processes and designs.

Mr. Peto: Is not the action of the Government, in fact, limited in placing orders for parts which are covered by any patent to the firm which holds those patents? **Sir W. Evans**: No; that is not so. The Government have full power to place any orders for any parts, whether or not they are covered by patents, wherever they think they can get the best production.

LOSSES (OFFICIAL REPORTS).

Mr. Billing asked, in view of the fact that our official reports of air losses at the front refer only to machines that are missing, whether any official record is kept of the number of our machines lost by crashing or being shot down behind our own lines; and whether the figures are published? **Mr. Macpherson**: Yes, sir; official records are kept, but they are not published.

Mr. Billing: Will my hon. friend say whether papers will still be allowed to suggest by headlines that there has been a considerable success owing to only a portion of our losses being published? **Mr. Macpherson**: I am not responsible for what appears in the papers. They are, like human beings, liable to be wrong. **Mr. Billing**: Can my hon. friend edit the Commander-in-Chief's report, which suggests this to the papers?

DAMAGED MACHINES.

On July 20th **Mr. Billing** asked the Under Secretary of State for War whether it is the practice in the Royal Flying Corps, when a machine is wrecked or badly damaged, immediately to destroy by fire those parts which are combustible and to bury non-combustible parts; and, in view of the present shortage of metal, if he will see that this procedure is discontinued? **Mr. Macpherson**: No, sir; this is not the practice. **Mr. Billing**: Surely my hon. friend is aware that this has been done repeatedly and is being done, and under those circumstances will he issue an order to see that it is restrained? **Mr. Macpherson**: I cannot add anything to the very definite answer I have given, in which I said it was not being done.

DISMISSED PILOTS.

Mr. Billing asked the Under Secretary of State for War whether, in view of our shortage of pilots for the defence of London, he will see his way clear to recall all pilots who have been dismissed from the Royal Flying Corps, or are in process of being dismissed, or who have been or are being called upon to resign their commissions from the same on account of their refusing to fly the R.E.8 machine or criticising other aeroplanes of official design and provide them with a suitable fighting machine, and arrange that they shall be formed into a special squadron for the defence of London? **Mr. Macpherson**: The answer is in the negative.

Mr. Billing: May I ask whether it is not the fact that there are hundreds of pilots, first-class, skilled pilots, who for social and service reasons have been dismissed or requested to send in their resignations to the Flying Corps, and will these men be put to some useful purpose in view of the shortage of pilots? **Mr. Macpherson**: My hon. friend's supplementary question has no relation to the question on the paper. I have already denied that any man has been dismissed from the Air Services on account of social reasons. The question my hon. friend asks me here is whether the authorities are prepared to take back to the Flying Corps men that he himself states refused to obey orders.

Mr. Billing: Is the hon. Member aware that many pilots who refused to fly in the air raid are skilled competent pilots, and only refused to fly because they did not believe the machines were safe? Will they be given an opportunity to try something else?

On July 23rd **Major Baird,** replying to **Mr. Outhwaite** (Hanley, L.), said: The Air Board exercises control over the construction of aircraft in that it is responsible for design. Contracts, however, for supply are placed by the Ministry of Munitions. Sir William Weir, a member of the Air Board, is managing director of G. and J. Weir (Limited), who are contractors for aeronautical supplies. He is not personally a contractor. Mr. Martin, another member, is managing director of the Daimler Company and Birmingham Small Arms Company, both of which are contractors for aeronautical supplies. He is not personally a contractor.

Mr. Outhwaite asked whether it was not a dangerous precedent that Government contractors or designers should be in a position to determine which of their rivals should be allowed to design or contract. **Major Baird** said these two gentlemen had given their services at great personal sacrifice, and had rendered incalculable services to the Air Board. They drew no salary from the Government.

[It might be interesting to find out whether any officers of either Service, holding posts under the Air Board, are interested financially in any firms now making aeroplanes or engines, or parts of aeroplanes, and when, if such interests exist, they were acquired. Also it might be well to know whether any such officers were concerned in the establishment of new firms in the Aircraft Industry, and whether any officers are concerned in inventions taken up by commercial firms.—Ed.]

Mr. Macpherson: I hope the House will allow me to make a personal explanation. I was asked the other day whether any

aeroplanes escorted H.R.H. Princess Mary to Southend, the imputation being that those machines were withdrawn from the defence of London. I then replied that no aeroplanes of the Royal Flying Corps escorted her Royal Highness. This answer, I regret to say, was incorrect, but it was given after the usual reference to the Training Brigade of the Royal Flying Corps and to the Home Defence Group. Neither of these authorities was, I understand, able to find at the moment any foundation for the assertion. From further investigation it appears that on the occasion of this visit the hon. secretary of the Royal Naval Hospital had approached the commander of the depot squadron in the neighbourhood, and asked him for a guard of honour. The Squadron Commander replied that if he had any machines flying on that day in the ordinary course of training he would raise no objection to their flying along the railway. The hon. secretary of the Royal Naval Hospital wrote to Sir Edward Wallington to this effect, and Sir Edward in reply wrote:—"I beg to thank you for your letter of the 7th inst. informing me that Major Moore has kindly offered to escort the Royal train on Wednesday next into Southend. I hope that nothing will be done in any way to interfere with the services of the Royal Corps, as they may have more important places to defend. I have spoken to Princess Mary, and her Royal Highness quite concurs in this." On the day in question, however, five training machines were practising formation flying, which is part of the ordinary course of training, and this flight flew eight miles up the railway and back to Southend. These were ordinary training machines, and each was manned by an instructor and pupil. They were not armed, and would not, in any circumstances, have been used for fighting.

This action was taken by the Squadron Commander without reference to any superior authority, and he has stated that since the flight was an ordinary and proper part of the training for which he was responsible he did not consider any reference necessary. Consequently, Headquarters here, upon whom I relied for my information, were not apprised of the fact. I have taken the first opportunity of stating all the circumstances and all the facts to the House, and I would personally express my regret that I had been the means of conveying to it information on this subject which was incorrect.

[Mr. Macpherson is to be congratulated on his explanation, which is an example of his invariably courteous methods. The incident with which he dealt is one which should never have been made the subject of questions, either in the House or out.—Ed.]

THE AIRCRAFT WORKERS' SPORTS.

On Saturday, July 21st, a sports meeting was held at the Stamford Bridge football ground in aid of the Y.M.C.A. Fund for Disabled Sailors' and Soldiers' Hostels and Trade Colonies. The competitions were confined entirely to aircraft workers, and the function is therefore of considerable interest to the aircraft industry.

There were no less than 30 events, with nearly 120 heats, and it is difficult to say which sex acquitted itself with the greater credit. Some of the ladies took their racing very seriously, and came equipped with most elaborate costumes especially constructed for the occasion. Others seemed to regard the affair more in the nature of a joke, and seemed quite content to run impeded by the latest creation.

The events and their results were as follows:—

100 Yards Flat Race (Boys).—1, A. Claxton (Napier), 11.35 sec.; 2, G. Parsons (Napier); 3, A. Williams (Grahame-White).

60 Yards Flat Race (Ladies).—Cellon and "Flight" prizes.—1, Miss White (Darracq); 2, Miss G. Phelan (Gwynne's); 3, Miss A. Peckham (Aircraft Co.).

High Jump.—Novellon Cup.—1, R. E. Smith (Napier), 5 ft. 2 in.; 2, E. Dixon (Hooper's); 3, M. Anderson (Darracq).

Half-mile Boys' Relay Race.—1, Napier team; 2, Whitehead team; 3, Darracq team.

220 Yards Flat.—Whitehead Cup.—1, J. Fowell (Darracq), 22 sec.; 2, W. Clennell (Napier); 3, T. Thomson (Napier).

Pillow Fight.—1, A. Powell (Caudron); 2, J. London (Whitehead); 3, S. Painter (Caudron).

Cigarette Race.—1, Miss Baker and Mr. Jimson; 2, Miss Stone and Mr. Mead; 3, Miss Freeman and Mr. Whitebarn.

2 Miles Walk.—Whitehead Cup.—1, J. Theobald (Green Engine), 15 min. 54¾ sec.; 2, H. Stevenson (Napier); 3, W. Watts (Grahame-White).

Tug-of-War.—Aircraft Mfg. Co.'s Trophy and Medals.—Sopwith team beat Handley Page team, 2—0.

100 Yards Flat.—Aircraft Supplies Challenge Cup.—1, Hicks (Handley Page); 2, Howell (Darracq); 3, Clennell (Napier).

Sack Race (Ladies).—1, Miss Earl (Darracq); 2, Miss Tysall (Handley Page); 3, Miss Baker (Darracq).

880 Yards Flat.—Aircraft Mfg. Co.'s Cup.—1, J. Welsh (Napier), 2 min. 10 sec.; 2, R. Lewis (Napier); 3, C. Ward (Darracq).

Half-mile Cycle Race.—Auster Cup.—1, G. Turner (Integral), 1 min. 13 sec.; 2, Scheidegger (Napier); 3, Rowles (Darracq).

Boat Race.—1, Highgate team; 2, Whitehead "A" team.
Sack Race (Men).—1, Jimson (Darracq); 2, Cleveley (Napier); 3, Kirke (Aircraft Mfg. Co.).
100 Yards Veterans' Race.—1, Hallett (Whitehead); 2, Boyten (Napier); 3, Phillip (Handley Page).
Three Miles Cycle Race.—Highgate Cup.—1, C. G. Turner (Handley Page), 10 min. 2 2/5 sec.; 2, C. Scheidegger (Napier); 3, S. Rowles (Darracq).
Long Jump.—Darracq Cup.—1, J. Hicks (Handley Page), 17 ft. 6¾ in.; 2, W. Clennell (Napier); 3, C. Russel (Gwynne's).
440 Yards Flat.—Whitehead Challenge Trophy.—1, Howell (Darracq); 2, J. Hicks (Handley Page); 3, Forster (Whitehead).
1 Mile Flat Race.—Triplex Challenge Trophy and Aeroplane Cup.—1, Norman* (Gwynne's); 2, Lewis (Napier); 3, J. Welsh (Napier); 4, W. Standen (Napier). [*The question as to whether this competitor was legally entered is under discussion, and the award is awaiting the decision of the A.A.A.]
Obstacle Race.—Gwynne's Cup.—1, J. Holden (Grahame-White); 2, Hook (Handley Page); 3, Anderson (Darracq).
Relay Race (1 Mile).—R.F.C. Challenge Cup.—Dead-heat, Gwynne's team and Sopwith's team. It was decided by lot that Gwynne's, Ltd., should hold the cup for the first six months, and that Sopwith's should hold it for the second six months.

The Championship Trophy, subscribed by the ten firms who competed last year, was awarded to Napier, who scored 19 points. Handley Page, Ltd., and Darracq, Ltd., were placed second with 10 points each.

Some extraordinarily brawny work was put into the tug-of-war, the teams being well matched. The cycle race was also particularly good.

The function was concluded by the presentation of the prizes by Her Highness Princess Helena Victoria, and both the work of the competitors and of the organisers of the competition reflects considerable credit upon the Aircraft Industry. Many firms presented prizes and cups, including the following, the order and titles given being those laid down by the compilers of the official programme :—

Darracq Motors, Ltd.; Integral Propeller Co., Ltd.; D. Napier and Sons, Ltd.; Gwynne's, Ltd.; Handley Page, Ltd.; Grahame-White Aviation Co., Ltd.; Triplex Safety Glass Co.,; Maples, Ltd.; Austers, Ltd.; Goldsmiths and Silversmiths Co.; Whitehead Aircraft Co.; Aircraft Manufacturing Co.: Palmer Tyre, Ltd.; Aircraft Supplies, Ltd.; Highgate Aircraft Co.; Hooper and Co.; Improved Liquid Glues Co.; The Aeroplane and General Publishing Co., Ltd.; "Flight"; Cellon, Ltd.; British Cellulose and Chemical Manufacturing Co.

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(Continued on page 276.)

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ON SOME DIRECTIONS FOR REFORM (II).

An Official Example.

So far as I can gather, there is, under the Air Board, as under all Government Departments, a regular plague of forms and regulations and rules, which hold up output, and much reform is needed in this direction. For instance, a friend of mine who runs a smallish factory wanted some small tools the other day—we will say they were hack-saws, though they were not. He requisitioned for them in the proper official way, and after many days' delay he was told that there were none to be had at the moment in that size. Then he told an official person that there were some in a shop, whose address he gave, round the corner from his works, but he was afraid to buy them for fear of breaking regulations.

The official person said that they would be bought for him. After still further delay he was informed that they could not be had—the reason being, as he discovered on investigation, that the official order had been sent twice to the wrong address. Finally the order *was* sent to the right shop, and then he was told that the hack-saws had been bought by somebody else in the meantime. All this took a couple of weeks, and, for all the official system did to help, certain very important aircraft parts would have been held up during that period.

As a matter of fact, my friend had gone and bought the saws himself as soon as he had told the official person about them and had set the official machine in motion. Consequently the parts were actually delivered just before the official system had discovered that it was impossible to supply the small tools with which to finish the work.

But there you have a priceless example of the effect of an official attempt to run a system which tries to combine the offices of a metal merchant, a wholesale dealer, a commercial traveller, a manufacturer, a retail shopkeeper, and a consumer, all under one hat.

The Practical French Mind.

The French tried a somewhat similar system of Socialism-run-mad ever so early in the war, and the French manufacturers broke the system by simply sitting still, sticking strictly to the system, obeying every regulation absolutely to the letter, and never acting on their own initiative, with the result that output was hopelessly jammed, and the officials rushed round and besought the constructors to go ahead any way they pleased, so long as they gave them output. And so the system was forced to break itself. But it was more than a little rough on the active-service pilots while the system was in process of breaking.

It is just the same with machine tools. Over and over again an aeroplane or aero-engine maker wants machinery and knows where to get it, and yet he cannot have it because some Consequential Cuthbert in the Air Board or the Ministry of Munitions refuses to exert himself to make out the necessary documents, or is afraid to take the personal responsibility involved.

By the introduction of a properly elastic system, whereby the responsibility was put on the manufacturer himself instead of on a lot of inefficient officials, half the business of documents, and release notes, and forms, and permits, and inspections, and viewings, and so forth, could be abolished, and output would go up by leaps and bounds.

Timber.

Dr. Addison has informed us, with an air of pride, that our present programme of construction requires more spruce than the present annual output of the United States, and more mahogany than Honduras can supply—and Honduras is accustomed to supply the requirements of the world.

Perhaps, when Mr. Churchill has dealt faithfully with the engine question, he will then tackle the timber question. It may interest him to find out why and when timber importers who know their business from A to Z were prevented from buying timber of the right sort abroad and shipping it to this country, and what has been the effect of the official attempt at buying timber.

So far as one can gather, the chief result has been immense delay in buying and shipping timber, and a secondary result seems to have been to unload a lot of unwanted timber of the wrong sort on constructors, owing to the fact that they have been unable to go and select their planks from merchants' stocks in the way which has proved so satisfactory in the past. Apparently there has been a still further waste of time and labour and material through this cause.

Typical Science.

The ingenuous, or ingenious, working of the official mind appears in an instruction sent out not long ago to the effect that it is thought that too little attention is given to the inspection of rough timber. Apparently officialdom thinks that the procedure for testing rough timber "should be almost exactly the same as the procedure for testing sheet steel and bar—in other words, samples should be taken, and if there is any doubt as to the quality they should be sent to the laboratories for test." Furthermore officialdom says, "In many cases rough timber appears to receive no inspection whatever. In others a purely visual inspection alone."

The spectacle of an Inspection Officer solemnly hewing out a cubic inch or so from a log and submitting it to a laboratory test is one which should rejoice the heart of the N.P.L., even if it moved a practical timberman to tears—of helpless laughter. When one considers that it is practically impossible to find a perfect plank, let alone a perfect log, one is astonished at the state of mind of an official who proposes to accept or condemn rough timber on the strength of a sample and

test by the same procedure as "for testing sheet steel or bar."

Steel is at least fairly homogeneous, but in timber one cannot tell till one has sawed a plank into smaller pieces whether or not there are knots or other defects which make it unsuitable for use. Timber which looks rotten in the rough may produce magnificent spar lengths if one knows how to dodge the defective spots, and a plank which would not give a single spar may give a fine supply of chassis or fuselage or wing struts.

It might be worth while to cut the end six inches off an over-long spar length and see whether that particular piece of timber gave approximately the proper specific gravity and crushing strength ascribed to wood of that breed, but one might easily find in the same plank other pieces of wood which were far below standard, and condemn the whole log on the strength of it.

Visual inspection by an experienced timber handler is the only test of timber on which one can really rely, for the testing of sample pieces in the way suggested may result either in the acceptance of a bad plank, with dire results to the aeroplanes made from it, or the rejection of a perfectly good plank, with consequent waste of extremely good raw material.

Over-Inspection.

As I have said over and over again in this paper, the whole inspection system needs overhauling. There is far too much theory and not enough practical common sense about it. As Mr. Massac Buist said recently in a wholly excellent article in the "Morning Post," "The Inspection Department is quite praiseworthy in theory, in that it aims at inspecting every mortal thing on behalf of our own—or, apparently, any other nation's—Aircraft Services, stage by stage during production. In practice, alas! it is quite the most effective means of preventing output that has yet been devised. It is, besides, a means of increasing cost, and is also quite astonishingly inefficient in detail. . . . The fact is the Department is in as thoroughly bad odour among those who wish to use aircraft as it is among those who produce them."

There you have the A.I.D. system in a nutshell, though it is important to note that in the A.I.D., as in every other department under the Air Board, there are many excellent men who could and would do all the necessary work in half the time if only they could have a free hand.

Mr. Buist continues: "It is high time the Government caused investigation to be made by an impartial and strong man as to how output is held up by what may be called the ineffective machinations of the A.I.D., for by no means all that it passes is perfect. May the Fates forbid that another committee or board should be set up for this work. . . . We live in an age in which we dissipate energy wholesale through committees which are so dear to the political type of mind because they are right excellent and almost infallible means of throwing the public off a scent. Unfortunately we have to deal with the Hun in the air and elsewhere, therefore in the matter of aircraft we must have the biggest output and the least delay possible; which means we cannot afford any more boards or committees. All that is needed is to put some reasonable limits to the well-intentioned obstructive tactics of the A.I.D. and to prevent it overlapping the work of other departments."

The Work of the Press.

Mr. Buist deserves a vote of thanks from all concerned for the good of our Flying Services for having written such a wholesale condemnation of the present state of affairs, and the Editor of the "Morning Post" deserves to be included in that vote of thanks for having dared to publish the article. One only wishes that other papers had similar independence and similar courage. When one contrasts the strong constructive criticism of Mr. Buist, on this occasion, with the flatulent sycophancy and flag-wagging flapdoodle of the "Daily Mail's" article of a couple of weeks ago one realises more than ever that despite all his faults the good old hardened Tory is still the real backbone of this country and may be relied upon to do the right thing when the occasion demands.

Compare with Mr. Buist's demand for reform the "Mail's" cocksure statement that "If no troubles with labour interfere, if no shortage of material compromises our plans, 1918 should see the Allies dominating the German lines with their air fleets and bringing—in the only way possible—the ultimate victory."

The "Mail's" "Special Correspondent" tells us that much on the strength of "two hours in close and intimate talk with the organisers of supplies for our air fleet." The public, and presumably the editor of the "Mail," doubtless prefer to believe their two-hour "expert" rather than the men who have devoted the best years of their lives to trying to drum into this country the need for proper organisation and supply of aircraft.

The Real Troubles.

Labour troubles and shortage of material pure and simple are the least of the causes of shortage of aeroplanes. Labour troubles arise through what the men call "being messed about" by officialdom. Shortage of material arises through waste by officials, rejection of usable material, condemnation of partly manufactured components, and scrap produced by absurd or impossible official designs.

The A.I.D. is to blame for much of the waste of material and labour, and consequent labour troubles—for a man who knows that the work he is doing is appreciated and valuable is less likely to be discontented and to agitate than is the man who knows that all his efforts are being wasted in producing food for the scrap-heap. But the Design Departments are at least as much to blame, for thence emanate the absurd designs which produce the wastage, and it is those departments which adhere rigidly to their own notions and refuse to permit latitude in methods of production or alterations in detail design which would expedite deliveries and reduce wastage.

Propellers.

Take a very simple instance of waste of material and labour. Dr. Addison has been talking about our enormous consumption of mahogany—most of which is used in propeller-making. There is no need to consume such vast quantities. Reduced consumption means reduced price, and the present price of mahogany is sheer robbery of the national exchequer.

A friend of mine, a practical propeller-maker of many years' experience, writes:—"It is quite an easy matter to economise fully 80 per cent. of the timber, and to increase the output by 120 per cent., by abandoning the geared-down four-blader in favour of the direct-driven two-blader.

"A (two-blade) propeller made recently for the 150-h.p. Hispano-Suiza-Spad gave, in competition with the leading French and English propellers, the best climb and horizontal speed, and had a diameter of only 7 ft. 8 in., with a weight of only 17 lbs., and the amount of timber used (averaged over 100 propellers) was 26 superficial feet per propeller. The time required for shaping was less than 25 hours.

"This compares very favourably with any of the official designs. The R.A.F. four-blader propeller for the R.A.F.4a engine (of less power) to drawing T6296, for instance, requires over 120 superficial feet, and takes 75 hours for shaping.

"A better-designed four-blader for the same engine would require about 80 feet super of mahogany, but if the propeller speed was increased to — or — r.p.m. (which is still a safe propeller speed) a small two-blader requiring not more than 30 to 40 feet super of mahogany could be designed to give quite satisfactory results.

"Four-bladers are only used to any extent in this country. Originally a brain-wave of Professor Lanchester's, they have been duly copied by the R.A.F. experts, though they are neither efficient nor economical in the making. They have no advantage whatsoever. It is always possible to design a more efficient two-blader, considerably lighter and cheaper, and very often with a smaller diameter."

There you have a perfectly clear case of official waste of labour and material, all on account of a theory which was sound enough when we flew heavy, slow machines with low-powered engines. In these days of big powers it is very doubtful whether gearing propellers pays in any way, except, perhaps, in enormously large machines.

The propeller-maker continues further by saying in effect that the design of propellers on present principles, though adopted over the whole world, does not seem to give the best results that can be obtained; at any rate, his experiments of the last two years seem to indicate clearly that a slightly different principle of design gives better results.

Recommendations.

In order to economise material and labour, he recommends:—

"(1) Increase in propeller speed instead of gearing down.

"(2) Two-blader propellers only.

"(3) Alteration in principle of design.

"(4) A standard engine-boss fitting, with a bore of not more than 70 mm. for all propellers absorbing less than 350 h.p.

"(5) Scarf and half-lapped joints to be allowed, as in French propellers—the present concessions for joints in two-bladers are dangerous and do not save material.

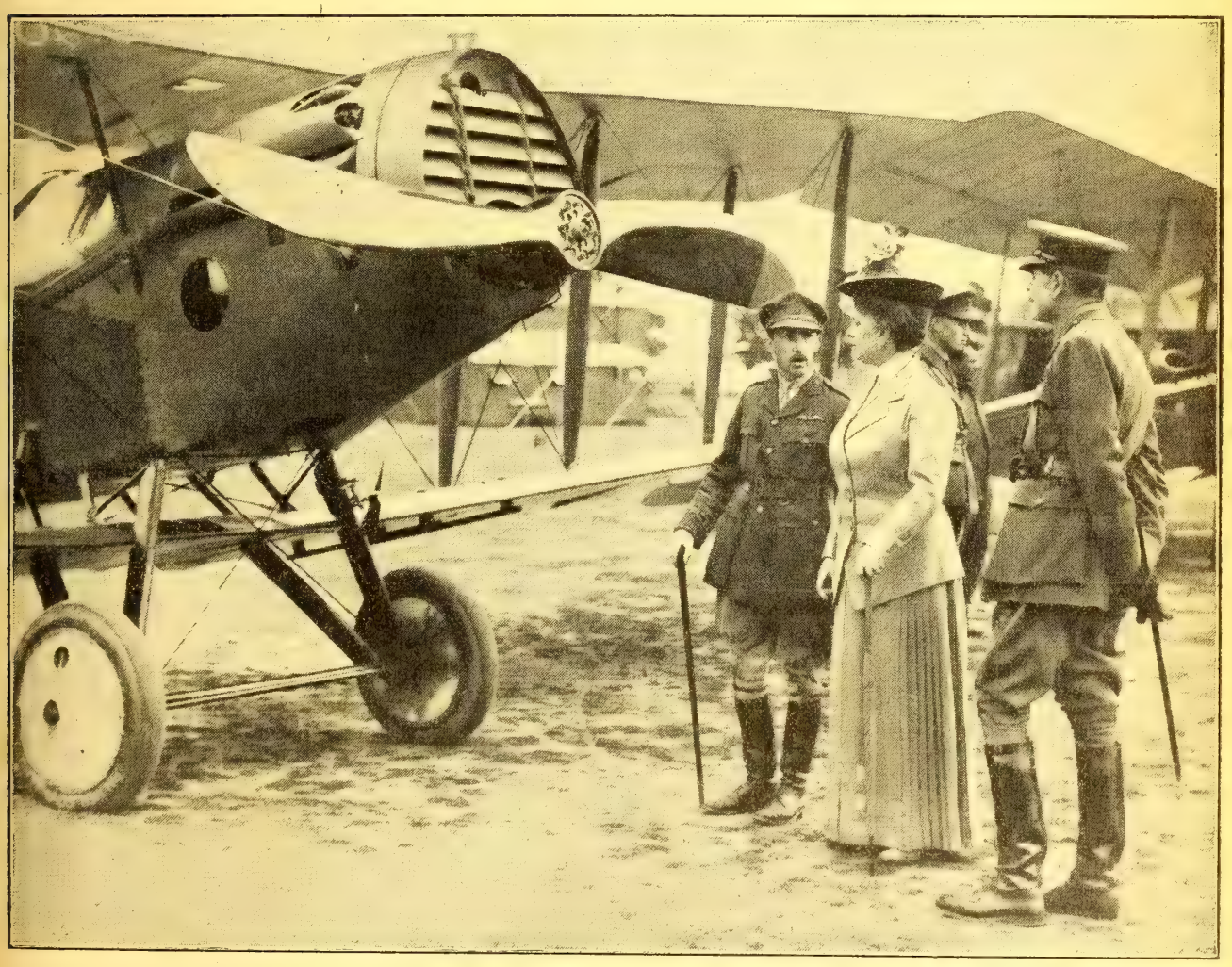
"(6) Gluing up 'en bloc' to be allowed. It is already allowed to some firms."

He admits that it would be expecting too much of officialdom to ask for all these suggestions to be carried out at once, but it seems to him advisable to abandon at least a few of the most wasteful propeller designs as soon as possible. For instance, one may mention the R.A.F. propeller to drawing T.5296, the Curtiss propeller to drawing A.D.616, and the Sunbeam propeller to drawings A.D. 501m and A.D.675.

Now, if Sir William Weir or Lord Cowdray deigns to act upon these hints and makes inquiries on his own account, he will naturally be met by a mass of technical evidence from people who seem much more anxious to save their own faces than to save material or even the lives of pilots who are anxiously awaiting more and better aeroplanes. Nevertheless, there are facts clearly set forth, showing how timber and labour may be saved.

The German Way.

Germany, also, is short of timber, and consequently the propellers on recently captured German aeroplanes



(From an Official Photograph.)

THE QUEEN WITH THE R.F.C.—Her Majesty with General Trenchard, inspecting a fighting machine. The curious Venetian blind over the radiator is of interest, as is the rack under the wing, which would appear to add considerable head resistance.

are simply a mosaic of short bits of wood of all sorts beautifully glued together. Whence comes all the glue is not known, but apparently it is at least as plentiful in Germany as timber for propellers. It cannot all come from the "Korpsvervaltungsanstalt," because there are not enough toe and finger nails on the human body to account for it all. But, anyhow, there is the glue, and very fine work it does. It does not suggest that the German air "experts" have turned down their best sources of glue supplies merely because their best glue-maker has refused to divulge his secret method of manufacture. And despite their patchwork propellers, the German aeroplanes are able to hold their own as flying machines against ours. Also, has anybody seen a four-blader on a German machine?

Our Way as It Is and Might Be.

Meantime, we, despite our admitted shortage of timber, insist on only using the big pieces which will go from the end of one blade to the end of the other. And we throw away in making each propeller quite as much timber as would make another one on the German principle.

Thus we see that, if we gave up the wholly English custom of using four-bladers, we should save at least half our timber and half our labour. And if we built mosaic propellers as every other country does, we should produce equally as many propellers from the same amount of imported timber. We could produce these latter propellers with the labour saved on the four-bladers, so that we could reduce our imports by half, and double our output with precisely the same number hands as we employ at present.

A Warning.

Do any of my brilliant young technical friends dispute the fact? If they endeavour to convince Lord Cowdray or Sir William Weir to the contrary, let the Chiefs of the Air Board remember one very important fact. If any of their technical people—always excepting the officers of the Regular Army or of the Navy who were in the Flying Services before the war, and a minute percentage of men of independent means who are really doing their best to serve their country—were half as clever as they make themselves out to be, they would not be working at the Air Board on Service pay. They would be drawing anything between twice and ten times the pay in the employ of ordinary commercial firms. Probably neither Lord Cowdray nor Sir William Weir realise to what an extent the "air experts" which have been thrust upon them are merely the throw-outs of the Aircraft Industry and of the Motor Trade.

More Waste.

Yet another cause of wastage, apart from wrong methods of design and manufacture, is the system of inspection. In any propeller factory one sees stocks of propellers, some partly finished, some wholly finished, rejected for some trivial defect which does not in the least detract from their usability. These are ultimately sawed up and burnt, whereas by letting in a patch or a piece here or there the majority of them could be made fit for service.

Again, there are thousands of pounds' worth of propellers wasted through the type of machine for which they were designed being "washed out." In some cases contracts for propellers are allowed to run on, and propellers are actually made, long after the type has been deleted. Some of these propellers, at any rate, could be re-shaped and made suitable for use on other types of machines.

Yet again, at some Service aerodromes, directly a propeller is ever so slightly damaged, it is scrapped, and is cut up into walking-sticks or others of those ingenious souvenirs, the making of which has now almost assumed the dimensions of a national industry. But at other stations even badly damaged propellers are rebuilt in the aerodrome workshops, with the result that hundreds of pounds are saved and the work of training is accelerated because there is no waiting for new propellers from store.

There seems no reason why all propellers which are not utterly smashed should not be similarly rebuilt, either at group headquarters workshops, or by the original makers of the propellers. Much of the small pieces of propeller timber resulting from sawing up planks, and at present used merely as firewood, could be used up in this way. It does not seem unlikely that a shipload or so of mahogany could be saved in the course of a year by this means alone.

The Bar of Novelty.

One of the greatest hindrances to rapid production of anything needed by the Services—not aircraft alone—is the unwillingness of various established departments to accept new ideas, consequently one does not expect very prompt results from any suggestions hereinbefore made which may smack of novelty. The odds always are in favour of a new idea being condemned simply because it comes from outside. When anything new is submitted, it has to be passed and approved by the department concerned. That department is also charged with producing novel instruments of the same nature. Consequently before a new idea can be adopted, the inventor has to convince the department that his idea is better than theirs—which is absurd. Q.E.D.

A Naval View.

Some time ago I was discussing this same eternal question with a very old friend of mine in the Navy, now a senior officer of sufficient service to have had his once bright brain worn into the regulation groove, sealed pattern 1897 or thereabouts. His theory is that it is never worth while for a Service technical department to bother its head about suggestions or inventions or ideas from outside, because the Service man whose duty lies in that direction will come across the same idea sooner or later.

According to him, out of every 10,000 inventions submitted, perhaps 100 are worth reading twice. Out of that 100 perhaps 5 contain germs of sense which might be developed into something, but probably 4 of them and the other 95 are already in use or in process of development. The 1 remaining invention of the 10,000 may be really good, but the Department would come across it for itself in course of time, and so it is not worth while to waste the Department's time in wading through the 10,000 for the sake of 1 idea, which would come to light in any case in a year or two.

I reminded him of a few little things like Whitehead torpedoes, Sperry gyro compasses, Marconi wireless, and so forth, which came from right outside the Service, but he still held that the Service would have discovered them for itself, if left alone by interfering newspapers and politicians, and would have saved itself a lot of trouble in doing it. I did not dare to suggest anything about aeroplanes, because I know that he regards all aircraft as a beastly nuisance which cannot possibly be of any use to the Navy, though possibly they may be necessary to the mob of leather-necks (Naval term for soldiers) ashore, who have no fire-control tops of their own, and who cannot get their scouts round the enemy's flanks as the Navy can with fast destroyers, or under the enemy with submarines as the Navy can.

He laments that a few really promising Naval officers have ruined their careers in the Navy by perverting to flying. He holds that on board ship their

aeroplanes get in the way and spoil the decks—the fact that the ship is commissioned as a seaplane carrier does not affect the question, of course: which rather agrees with my own view that an aerodrome would be a charming place if it were not for a lot of noisy aero-engines interfering with conversation, and a lot of aerial acrobats distracting one's attention. Also, he has a supreme contempt for their fiddling little engines of a hundred or a couple of hundred h.p., never having been conveyed himself by less than some thousands of h.p.

He treats with scorn my humble suggestion that the stick-and-string Navy of fifty to a hundred years ago held precisely similar views about his oily engines, and clock-work torpedoes, and tin-sided ships, and silly guns that load at the wrong end: all of them accursed novelties which in their day were considered to make the Navy a profession unfitted for a gentleman.

Strange as it may seem in so new an arm, one finds the germs of similar conservatism creeping into the Flying Services, with the inevitable result of hampering new ideas. But the root cause of all this conservatism is that the new ideas come from outside and do not originate with the Department most concerned.

ON ENGINES AGAIN.

Take the question of engines again. If some new idea for an engine is started inside a Department, any quantity of material and labour and machinery can be found to develop it, no matter how freakish the design. If a Government Factory cannot tackle the job, some favoured commercial factory is found to take it up. Quite possibly an official from the Department concerned is told off to look after the job, and to superintend the experiments and output. Apparently it does not matter much whether the particular official has had any success in any other of his ventures. If he is in favour in the Department that seems to suffice. And if the whole thing is only another official failure, the firm is presumably paid handsomely for the work done, the shareholders get their dividends, and so it is nobody's affair to raise a row about the waste of man-power and material which might have been employed in turning out engines of use for war service.

But if a new design of proved value is submitted from outside, things are very different. No matter how the proprietors of the design set to work, no matter from what angle they attack officialdom, whether through ordinary official channels, through the Board of Inventions and Research, through political people, or any other way, eventually they bump into the same department, where they are merely boomed off by understrappers, apparently youngsters who are there for the purpose, and who are unable to discuss the technical points of the engine which they are told to reject.

Consequently one finds two results. Firstly, really promising engines, which need perhaps a little more experimental work, are not developed because they cannot obtain official approval. And, secondly, engines which are really useless freaks are not properly squashed, and so people go on wasting time and money on them.

A Case in Point.

Take the case of an engine of which I know personally. It has done extraordinarily fine bench-tests, but the experimental engine was built so long ago that it is now admittedly too heavy for a modern aeroplane. It has been boomed off by one official after another till the people behind it are sick of the whole business, and will not put up the money to build a bigger and lighter sample, because they feel that this also would be boomed off for fear it should beat the officially favoured designs. Even if they put up the money, they would need more material and machinery to make it, and then they would be up against fresh departments in the endeavour to get the material and machinery.

Some really intelligent officer concerned with engines has written to one of the proprietors of the engine, saying, "It is suggested that it would be best for you to get in touch with the leading aero-engine designers and constructors, with a view to one or other of them interesting himself in [the special features of the engine] and possibly incorporating it in a future design." That seems reasonable enough at first sight. I suggested the same thing myself to the proprietors six months or more ago, on the off chance that the design might appeal to someone. But, as I feared, every engine firm has its own designer, and to ask a firm to take up an outside design, except under official inducement or pressure, as already exemplified, is about as hopeful a job as asking an official "expert" to adopt an outside design. The firm's designer is not likely to admit that the outside designer is cleverer than he is himself. One cannot expect in a mere commercial designer a higher standard of honesty and truthfulness than one finds in a technical official in the King's Service, even if one does not wholly accept Colonel Archer-Shee's *obiter dictum* that no officer in the King's Service is capable of lying.

The Round-the-Corner Way.

Another official, who apparently has the intelligence to appreciate the engine without the power to have it made, has offered to one of the proprietors a priceless piece of advice. He suggests that the designer of the engine, who is also part proprietor and constructor, and an excellent engineer, should get an appointment in some large controlled firm, introduce the engine there, get the firm interested in it, and then induce them to build a trial engine.

Now, there you have a perfectly priceless example of the way this country is run under our modern system of Socialism-run-mad. Instead of the Department concerned doing its job honestly, and using the nation's money to experiment with and test what is most promising, the Department as such merely blocks inventive talent and impedes progress in most necessary directions. But a few intelligent and earnest officials who have the nation's welfare at heart before their own go to some trouble and risk to advise worthy people how best to get round regulations.

Practically every step in progress and almost everything sensible which is done in this country at present is done in some such round-the-corner way as that suggested. There must be considerably more brain-power expended in this country per diem in getting round or dodging foolish Government regulations, and the orders of obtuse or foolish Government officials, than there is in straightforward effort to win the war.

A Cause for Wrath.

When one thinks of the suffering of our youngsters at the front, and of the gallantry they have shown under the most depressing conditions, all due to shortage of engines of the right sort, and when one thinks, and knows, that this shortage is caused entirely by gross ignorance, and wicked intrigue among the people whose duty it has been to expend their whole energy

in equipping the Flying Services adequately, one feels like going out for somebody's blood.

The papers and the House of Commons bleated loudly enough over the Mesopotamian scandal, and presumably some of the officers concerned have had their careers ruined, even if the politicians concerned have not. But why the outcry over Mesopotamia and not over the Flying Services? Presumably because at some time or another the ordinary stupid Englishman has had a pain in his stomach, or perhaps even a touch of dysentery, and has felt the heat of the sun too much for him. Therefore even his dull brain has been able to envisage the sufferings of those poor devils stewing in their own juice for fourteen days on an unshaded barge down the Tigris.

But never having been in an aeroplane, never having been a target for a shell or a bullet, and never having been in a life or death fight, the Englishman is unable to envisage the sufferings of the poor devils who have to put up the best fight they can against the finest aeroplanes in the world—in performance if not in construction—with underpowered aeroplanes and unreliable engines. Having forgotten most of what he learned about the flames of Hell in his youth, he cannot envisage the sensation of falling for interminable thousands of feet in a flaming aeroplane. And having too thick a skull ever to have hurt himself by falling on his head, he cannot envisage that sickening thud into the ground which mercifully puts an end to the troubles of the outclassed aviator.

Shake Out the Hindrances.

And because there is not sufficient agitation to stir up the public and so to shake up the Air Board into getting rid of its inefficients, one sees extracts from letters like this: "There seems no prospect of my fellows getting a new type of machine for the next four months. There seems nothing to be done, as the High and Mighty decide these matters quite regardless of results."

"We do the furthest work, but have the slowest fighting machines, bar about one type."

"It is useless complaining to —— or telling him that the machines are out of date, as he must know it already."

"Since this letter was started, a patrol has come in in tatters. Leader badly wounded, last man also. Both out in the country crashed. They were hopelessly outclassed and outpaced. It seems frightfully hard that they should suffer from lack of proper material."

"Things are pretty dismal. They are stopping the delivery of new machines for us, and supplying them for home defence. It may suit those at home, but certainly does not suit us out here."

"The engine we are using now was in active service in France 31 months ago, and has deteriorated in that time, due to the fact that it is made in England now."

And yet we have the finest aeroplanes and the finest engines in the world in this country, if we would only produce enough of them.

Those are not merely extracts from chronic grumblers. They represent the voice of experience. A few active-service pilots on the newest and best machines will perhaps disagree. But if only a dozen experienced pilots felt as those extracts indicate, would not that alone be enough reason for the complete reorganisation of engine supplies, and the institution of a sworn inquiry into the behaviour and actions of those who have been responsible for the failure of supplies of efficient aeroplanes and engines?

If it is worth the while of the Government to prosecute in the case of alleged taking of commissions on a few thousands or a few million pounds' worth of aeroplanes bought abroad, is it not worth the Nation's while to insist on the punishment of those who have cost us so many lives, and the waste of so much irrecoverable time and labour and material through their slackness, or incompetence, or intrigue, whichever it may be, in the production, or rather the non-production, of engines?—C. G. G.

TIMBER FOR AEROPLANES.

The following is from the "Sunday Times" of July 29th:—

Sir,—It is a point of notoriety in the timber trade, amongst those who know their business, that the lack of knowledge possessed by our legislators in general, from the Prime Minister downwards, in regard to timber has been very noticeable during the period of the war.

The assertion made by the Premier some little time ago, that the timber at present grown in this country was, if utilised, sufficient for our needs, is absurd.

To welcome a body of lumbermen into this country to fell timber, irrespective of the season, is really an outrage against the ordinary timber merchant.

To fell trees, of any nature, during a season when the sap is up, is against all principles of arboriculture. The disasters that would occur in consequence of using green timber felled with the sap in it has yet to be seen, and I think one should not be surprised to find some serious disaster in store in more than one direction.

Again, Dr. Addison, speaking about timber required for the manufacture of aeroplanes, made the extraordinary statement that the whole yearly output of spruce produced in the United Kingdom was needed, and further, that more mahogany was required than Honduras could supply.

I have yet to learn that there is any spruce grown in this country that is clean enough and in probable condition for aeroplane building, and I think I could suggest, from my knowledge of hard wood generally, that there are other places than Honduras from which to get mahogany for aeroplane building, and, moreover, there are quite a number of other woods that would do equally as well.

Whilst on the same subject, they do not refer to the scarcity of plywood, a wood that is generally used in seaplane and aeroplane building. There are large quantities of this wood ready for shipment, if the Government would only be guided by those who know, and provide means for shipping it, instead of which, although the scarcity is so acute, they leave this industry to get its oddments shipped as best possible.—Ut Prosim.

PREJUDICE.

The following letter appeared in the "Morning Post" of July 25th:—

Sir,—In your issue of the 19th inst. there appear two letters as to Mr. Winston Churchill's appointment as Minister of Munitions, one from Lord Stafford and the other Mr. James Glass. Your heading is "Mr. Churchill's Appointment Resented." It is resented by the people who have brains, and this resentment is not confined to a few. We, as the public, have to pay the gentleman in question, and, therefore, it is ourselves that should demand that proper service should be rendered us. Mr. Churchill has not proved himself efficient in any of the positions he has occupied in the Governments that he has graced with his presence. One cannot doubt his energy, his desire to do his best, yet it remains that he has not proved "good" in any of the positions. Antwerp, a ghastly fiasco. The Dardanelles worse. And the boast as to the "hornets" that he promised the public that the Huns would get stung by, where are they? Had Mr. Churchill been employed by a business firm he would have got the "sack," and his employers would not have been so generous as to give him a pension. Mr. Lloyd George has, as mentioned by Mr. Glass, flouted public opinion in appointing Mr. Churchill to the position of Minister of Munitions, and one can only hope that there will be such an outcry as to remove him from office in the Government during the war.—Yours, etc.,

W. H. G. SPINDLER.

[The letter only shows how far prejudice can go. The Antwerp affair resulted in holding up of the German advance in Belgium for six most critical days, and so enabled our Army in Flanders to occupy a better position than would otherwise have been possible. And all this at the cost of a couple of thousand untrained men interned in Holland, and a few casualties.

The Dardanelles business was a capital effort, spoilt by the muddling of other people. And the hornets were well on the way to being hatched when Mr. Churchill's incubating influence was removed, and his excellent plans were again muddled by incompetents. It is curious how people fix on just the wrong points on which to abuse Mr. Churchill.—Ed.]

THE FUTURE OF THE ROYAL FLYING CORPS.

SOME POSSIBILITIES.—III.

BY "BERKELEY."

General the Earl of Wellington, in a letter written to the Earl of Liverpool, Prime Minister of England, from Fuente Guinaldo, in Spain, on June 10th, 1812, said that "The foundation of every system of discipline, which has for its object the prevention of crimes, must be the non-commissioned officers of the Army." The mythology of popular military history also gives the same distinguished soldier, when in later days he had attained the ducal state and had earned the baton of a field marshal, the credit of the authorship of the phrase which in convincing baldness says that the non-commissioned officer is the backbone of the British Army.

The Eternal Spirit.

The times have changed, and generations have come and gone since men died under Wellington in Spain, but the British Army has not greatly varied its virtues or its vices. The march to Coruña and the march from Mons are brilliant with the same courage and pertinacity. Salamanca and Ypres have seen the same manner of war. Badajoz and Cologne—shall we say?—may bear fateful resemblance in their respective days of historic prominence. The spirit of the soldier has not altered. The sergeant who sweltered in his scarlet tunic on the fire-swept beach of Aboukir in 1801 could sympathise with true insight in the troubles of the later sergeant who landed in all the pomp and horror of war at Cape Helles over eleven decades later.

The non-commissioned officer is to-day, as ever, a vitally important section of the Army. He represents stability. Under peace conditions of short service, whether conscript or voluntary, the rank and file are constantly changing. Even in the commissioned ranks the periodic change is considerable. Some officers retire, others are posted to the staff, and others resign when the monotony of the life overcomes its attractions.

The Back-Bone of the Army.

But in the intervening ranks there is a greater duration of service. The non-commissioned officer remains true to the life of the regiment. He rarely transfers to other units, and he invariably spends the best years of his life with the corps in which he began. He learns his work by experience both in the ranks and in his small command. As the training is slow, it is all the more sure. He keeps alive the tradition of the regiment with the new recruit, and he steadies imperceptibly the sweeping impetuosity of newly joined officers.

It is not possible to reduce to terms of speech the part the non-commissioned officers of the old Army have taken in the formation and the training of the legions which now follow the King's bugles beyond the seas. To them is due a very large share of the credit. There are few officers now serving who will have the temerity to gainsay this.

Abroad in the more efficient armies it has been much the same. The whole system of the German army is bound up in the skill and efficiency of the non-commissioned officer. He is responsible for a large share of unit administration in times of peace, and in action it is he who leads the men in minor tactical operations.

The German officer undergoes a more intensive and continuous initial training than is common with us or in other European armies, and he is considered by the Higher Command to be of too great value to be carelessly expended in the routine fighting of the daily war. His duties are to direct and not to lead in the fight, unless occasion demands the supreme sacrifice. He is then no less willing to demonstrate his courage than are his enemies. In days of peace, when he is not carrying out the work of the day, he is generally adding to his knowledge of his chosen profession by continual study of the military literature which appears in profusion when the distraction of war is absent. His range of technical military knowledge, man for man, is greater than that of his corresponding rank in the British Army, but he is less in touch with his men, and he rarely understands the art of personal leadership. He is proper to the conditions of his own army, but he could never attain success if he had the direction of British soldiers.

The high degree of professionalism of the German officer brings the non-commissioned ranks into greater prominence in the German Army than is elsewhere the case. The well-trained non-commissioned officer is essential to success. His duties, in so far as the higher ranks are concerned, in some manner compare with those of English subalterns, and his responsibilities are not less.

The Direct Entry N.C.O.

There is an essential difference in the manner by which the non-commissioned ranks are filled in the British and the German armies. Here, in England, from corporal to sergeant-major, all are promoted from the ranks after a varying period of unblemished service. None, save in the emergency of war, is taken in by direct entry.

In Germany the 90,000 non-commissioned officers in the army during times of peace are obtained in two ways. The majority—that is, from 70 to 75 per cent.—are drawn from the ranks, as is the custom in other countries. The remainder, between the ages of 14½ and 17, enter special preparatory schools for non-commissioned officers, and undergo a course of general education for a period of two years.

From this class of school those who are satisfactory pass to one of the nine non-commissioned officers' schools in Germany for a further two years' course, this being spent in the acquisition of the rudiments of military science. Some men enter these schools directly from civil life, in which case they must remain for a period of three years.

Those whose conduct and efficiency are most highly gratifying to the responsible authority receive their due reward in being posted as *Unteroffizier* (underofficer) to such regiments as they have selected in earlier times. Less successful aspirants become *Gefreiter* (lance-corporal), or are placed in the ranks, from which they emerge a few months later should intelligence have come to them at the behest of experience.

Young though the latter classes are in comparison with those who have risen from the ranks in the ordinary course, they are much sought after as *Feldwebels* (sergeant-major) and *Zahlmeister-Aspirant mit Feldwebel-Rang* or *mit Sergeant-Rang* (Aspirant Paymaster). No definite news has come through as to the behaviour of the non-commissioned officers during the present war, but it is known to have been good. They have not been lacking in courage nor in intelligence commensurate with their positions in the army.

In any reformation of the Royal Flying Corps which disconnects the duties of the piloting and of minor

observation from the rank of officer there would be a consequent change in the position and duties of the non-commissioned officers. Would it not be possible, if one be permitted to assume that everything that is German is not inherently bad, to adopt the system of obtaining a percentage of non-commissioned officers by direct entry after a period of training in special schools formed and maintained for the purpose?

The Intermediate Class.

There are particular conditions which would make such a system of high value to such a unit as the Royal Flying Corps. The nature of the life and often an accompanying ignorance of its duties attracts to the corps types of pilots or engineers who, while neither mentally nor socially fit for commissioned rank, are possessed of too many prominent attributes to permit of their happy or profitable inclusion in the ranks.

Moreover, the officer of the future will differ from the temporary and gallant substitute of wartime in that he will be highly trained in the intricacies of his profession. His knowledge will not be restricted to facility in a vivid but accurate imitation of the natural or unnatural evolutions of the least respectable fowls of the air, nor to a spectacular species of aerial letter-writing with an overheating machine-gun as pencil and a resilient German body as the impressionable material on which it is desired to inscribe a mark.

Therefore only such candidates as have a due regard for the proprieties of war and have proved either their knowledge of its rules or their intention of learning the art of authorised murder should be accepted for the King's Commission in the Royal Flying Corps.

In such case those who did not care for mental effort and whose chief interest was in the practical art of flying might, if their standard of education and moral fitness were proper, be admitted to a training school with a view to admission as a non-commissioned officer at the end of the course.

By this means there could be formed a powerful body of mechanics, who in the placidity of civil life would be graded as foremen, and of pilots whose skill would have meant fortunes if aviation had never outgrown its infancy. A class would be attracted which, unwilling to become officers from an honest recognition of unfitness, yet would not care to serve in the ranks alongside men whose unpaid tobacco bills had made civil life displeasing to them.

Our Versatility.

Promotion of rankers would be but little interrupted, as the direct-entry class should be a fixed low percentage of the whole, and difficulties of seniority could be adjusted in the necessary Royal Warrant authorising the change. Precedent does not matter, as a nation which can give official sanction to so charming a title as "Tank Corps" is capable of almost anything in the entire world.

One of the chief difficulties in the formation of a unit —especially one so large and important as the Royal Flying Corps—is the selection and training of a body of non-commissioned officers. Other regiments do not care to permit N.C.O.'s to transfer, so valued are they in the military world, unless, indeed, they are inefficient, in which case nobody wants them.

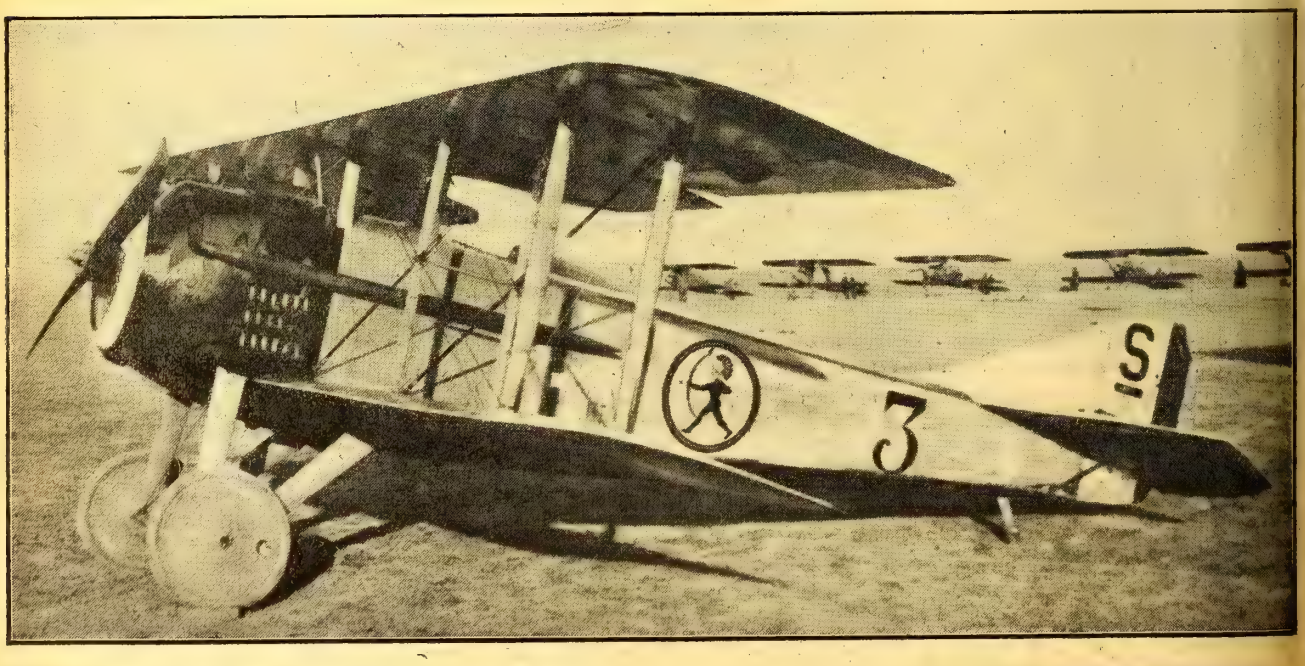
Once selected and trained, it is not desirable that N.C.O.'s of a unit should be on short service, or that they should be promoted to commissioned rank, unless in the latter case it is quite clear that a good officer will be made and not simply a good non-commissioned officer spoilt.

The scheme briefly suggested in this article may be visionary; it may in the view of some be impracticable; but it is perhaps not unworthy of consideration.

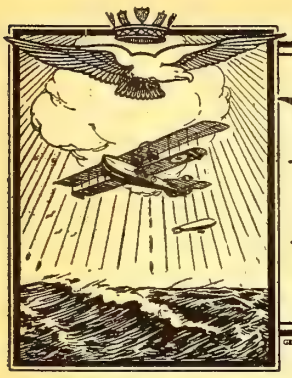
MR. HOLMAN AT HENDON.

Mr. Holman, Premier of New South Wales, was given facilities by the Air Board for visiting the works of the Aircraft Manufacturing Co., Ltd., on July 27th, where he was received and shown round by Mr. Holt Thomas. Before he left Australia Mr. Holman took a prominent part in the establishment of a State Aviation School at Richmond, near Sydney, in connection with which it is hoped to erect a factory. Mr. W. J. Stutt, late of the Bristol Co., is in charge of the school.

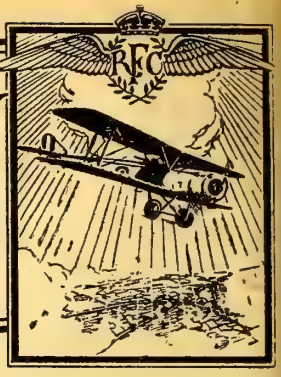
Mr. Holman's visit to Hendon was arranged in order that he might have an opportunity of seeing the extent to which aeroplane construction has been carried in this country, and of obtaining information which might be of value in the erection of works in New South Wales. He was impressed by the demonstration of skill in design, as well as the industry displayed in construction, and after visiting the factory he proceeded to Hendon aerodrome, where he witnessed an excellent exhibition of flying.



THE S.P.A.D. BIPLANE.—A photograph circulated in a neutral country by the enemy, showing a captured Spad with Hispano-Suiza engine. Behind it may be seen a line of Albatros "chasers."



NAVAL and MILITARY AERONAUTICS



FROM THE "LONDON GAZETTE."

War Office, July 24th.

REGULAR FORCES.—Staff.—The following temp. appt. is made at the War Office :—G.S.O., 2nd Grade.—Major M. Freeman, Worc. R., Spec. Res., from a Staff Officer, R.F.C., 2nd Cl., vice Bt. Lt.-Col. R. J. Armes, N. Staff. R., April 25th.

Establishments.—R.F.C.—Mil. Wing.—Staff Officer, 2nd Cl. —(Graded for purposes of pay as a G.S.O., 2nd Grade, at the War Office).—Major M. Freeman, Worc. R., Spec. Res., from Adjt., Feb. 28th.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld. :—Sec. Lt. S. E. Brown, Spec. Res., July 7th. Lt. S. H. Clarke, M.C., Wilts R., Spec. Res., July 10th.

Memorandum.—Temp. Sec. Lt. H. Bromley, R.E., relinquishes the rank of temp. Capt. on ceasing to be empld. with R.F.C., July 6th.

War Office, July 25th.

REGULAR FORCES.—Staff.—Dep. Asst Dir.—Sec. Lt. (temp. Capt.) G. W. A. Brown, R.F.C., Spec. Res., from an Equipment Officer, 1st Cl., and to retain his temp. rank whilst so empld., vice Capt. (temp. Lt.-Col.) F. A. Wanklyn, M.C., R.A., July 4th.

War Office, July 26th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing. —Sqdn. Comdr.—Capt. (Temp. Maj.) A. H. Jackson, Notts and Derby R., from a Chief Instr. in Gunnery (graded as a Sqdn. Comdr.), School of Mil. Aeronautics, and to retain his temp. rank whilst so empld., July 5th, seny. Oct. 25th, 1916.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld. :—Lt. E. M. Lugard, R. Lanc. R. ; Lt. J. Butler, M.C., R. Ir. Fus. ; Sec. Lt. A. C. Reeves, Spec. Res. ; Temp. Sec. Lt. C. D. Smart, Gen. List, July 12th. Temp. Lt. H. W. Woollett, Gen. List ; Lt. S. R. P. Walter, R. W. Surr. R. ; Temp. Sec. Lt. (temp. Lt.) L. A. Hardwicke-Terry, R.E. ; Sec. Lt. St. C. C. Tayler, R. Suss. R., July 13th.

Adjt.—Maj. Lord R. E. Innes-Ker, I. Gds., Spec. Res., from a special appt. (graded as a Park Comdr.), July 4th.

Park Comdr.—Capt. A. F. A. Hooper, N. Staff. R., from an Equipment Officer, 1st Cl., and to be temp. Maj. whilst so empld., June 23rd.

Memorandum.—Gen. List.—The undermentioned to be temp. Sec. Lt.—June 26th, 1917 : Sec. Cl. Air Mech. Ronald Ponting Allison.

* * *

The King has been pleased to approve of the appointments of the following officers to be Companions of the Distinguished Service Order in recognition of their gallantry and devotion to duty in the field :—

Sec. Lt. (temp. Capt.) John Oliver Andrews, M.C., R. Scots and R.F.C.

For conspicuous gallantry and devotion to duty in leading offensive patrols with great dash and success on over 30 occasions, and taking part in over 22 combats. His skill and courage in attacking and destroying hostile aircraft have at all times been magnificent.

Sec. Lt. Samuel Hollis Alfred D'Arcy, R.F.C., Spec. Res.

For conspicuous gallantry and devotion to duty, in continually attacking and dispersing hostile infantry and transport from a very low altitude. Whilst engaged in this he was wounded, but refused to return until he was almost unconscious. He also showed great courage and determination on several occasions in attacking hostile aircraft, destroying some and forcing others to descend.

* * *

The King has been pleased to award a Bar to the Military Cross to the following officer :—

Lt. (temp. Capt.) William Victor Strugnell, M.C., Hamps. R. and R.F.C.

While leading an offensive patrol he attacked and brought down a hostile machine. Later, in the same patrol, he brought down a second machine. In all, he has accounted for five machines and a kite balloon. (M.C. gazetted June 3rd, 1916.)

* * *

The King has been pleased to confer the Military Cross on the following officers in recognition of their gallantry and devotion to duty in the field :—

Sec. Lt. (temp. Lt.) Robert Stanley Aitken, R.G.A. and R.F.C.

On several occasions he made most valuable reconnaissances of the enemy's line, and on two successive days he engaged and severely damaged hostile batteries, working under most adverse weather conditions.

Sec. Lt. Valentine Henry Baker, Gen. List and R.F.C.

In a large number of aerial combats he showed the greatest daring and determination. On one occasion alone, he flew at a low altitude over the enemy lines, attacking and dispersing enemy artillery, infantry, and transport, and returned with a valuable reconnaissance report concerning the retiring enemy.

Sec. Lt. Giles Noble Blennerhassett, R. Ir. Fus., Spec. Res. and R.F.C.

He has shown great skill and courage when acting as escort in attacking hostile formations. On one occasion he attacked two hostile machines, driving both down out of control. Later, he forced three other machines down.

Sec. Lt. Hamilton Blofeld, R.F.C., Spec. Res.

For conspicuous gallantry and skill. Whilst registering a long range gun, he was attacked by five Albatros Scouts, and was severely wounded in several places, the observer being shot through the wrist. The petrol tank having been pierced, he flew back to his own aerodrome, and was unconscious when taken out. His courage and skill saved both their lives.

Sec. Lt. (temp. Lt.) Jocelyn Ernle Sydney Patton Bradford, W. Rid. R. and R.F.C.

On three separate occasions his accurate information enabled our artillery to engage and destroy enemy guns and emplacements. He afterwards attacked and inflicted serious damage upon a hostile battery, using his machine-gun from a very low altitude.

Temp. Sec. Lt. Geoffrey Hornblower Cock, Gen. List and R.F.C.

On many occasions he showed great courage and determination in attacking and destroying hostile aircraft, and in dispersing hostile troops from a low altitude. His skill as a formation leader has set a fine example to the other pilots of his squadron.

Sec. Lt. (temp. Lt.) Stanford Gavin, Devon R. and R.F.C.

As observing officer in the artillery he showed great ability and conspicuous courage under shell fire. On two occasions he was compelled to parachute down from burning balloons, but this in no way lessened his enthusiasm. The loss of a foot necessitated his being sent home, and his valuable services have been greatly missed.

Temp. Sec. Lt. Albert Earl Godfrey, Gen. List and R.F.C.

For conspicuous gallantry and devotion to duty in constantly attacking hostile machines at close range, regardless of personal risk or of their being in superior numbers.

Lt. Rogert Bolton Hay, W. York. R., Spec. Res. and R.F.C.

On several occasions he has shown the utmost courage and dash in attacking and dispersing hostile aircraft in superior numbers. His willingness to undertake the most hazardous duties has at all times set a fine example to other pilots and observers of his squadron.

Temp. Lt. Thomas Falcon Hazell, Gen. List and R.F.C.

On several occasions he displayed marked courage and determination in attacking and destroying hostile aircraft.

Temp. Lt. Fred Parkinson Holliday, Gen. List and R.F.C.

In company with another pilot he attacked five hostile aircraft, setting one on fire, driving down another out of control, and dispersing the remainder. He has previously done fine work, bringing down eight hostile machines in all.

Sec. Lt. Jeffrey Batters Home-Hay, Arg. and Suth'd Highrs. and R.F.C.

He showed consistent ability and courage in observing for and ranging our artillery upon enemy guns and trenches. His accurate information was of the greatest value to our batteries.

Temp. Sec. Lt. Geoffrey Knight, Gen. List and R.F.C.

He showed great dash and promptness in diving to the assistance of one of his squadron, who had been attacked by five hostile scouts, and dispersing them. His assistance to our artillery in engaging hostile batteries from a low altitude was of the greatest value.

Sec. Lt. Matthew Laurence Maguire, Conn. Rang. and R.F.C.

With great courage and skill he attacked and completely destroyed an enemy aeroplane, which crashed to the ground from 4,000 ft.

Sec. Lt. (temp. Capt.) Reginald George Hewitt Pixley, R.F.A. and R.F.C.

He attacked a hostile balloon with three other pilots and, remaining after they had left, finally sent it down in flames. He has assisted in bringing down several hostile machines, and has done good work throughout.

Sec. Lt. Robert Wolstenholme Reid, R.F.C., Spec. Res.

He has done fine work in taking aeroplane photographs. This work has been carried out while flying at very low altitudes and often under very heavy machine-gun fire.

Capt. (temp. Maj.) Alan John Lance Scott, Yeo. and R.F.C.

He has on several occasions attacked and destroyed enemy aircraft, and taken successful photographs under heavy fire. He has constantly shown the greatest courage in attacking numerous hostile machines single-handed, during which on two occasions his own machine was considerably damaged. His great coolness, dash, and resource have set an excellent example to his squadron.

Lt. (temp. Capt.) James Geoffrey Selby, R.F.A. and R.F.C., Spec. Res.

During a photographic reconnaissance he was attacked by five hostile scouts, whom he put to flight, continuing his work with complete success. He afterwards attacked and put to flight an enemy battery. His work at all times has been marked by the greatest courage and ability.

Lt. Oliver Manners Sutton, S. Lanc. R., Spec. Res. and R.F.C.

On at least eight separate occasions he showed great determination in attacking hostile aircraft, destroying them or driving them down out of control, and he has also done very good work in other flights by preventing hostile aircraft from getting on the tails of other machines. On one occasion, though his gun jammed, he dived three times and drove off an enemy machine.

Sec. Lt. Patrick Gordon Taylor, R.F.C., Spec. Res.

He has taken part in over 40 offensive patrols at low altitudes and under heavy fire from the ground. He has always shown exceptional dash and gallantry in attacking large formations of hostile machines, setting a very fine example to all his comrades.

Sec. Lt. (temp. Capt.) Stanley Wedgewood Taylor, R.F.C., Spec. Res.

He has at all times shown the greatest fearlessness, especially in volunteering for any duty entailing special risk. His dash and determination in engaging hostile machine-guns, transport, and bodies of troops from a very low altitude have been most marked.

Temp. Lt. Robert Parker Musgrave Whitham, North'd Fus. and R.F.C.

On four successive days he showed remarkable courage and ability in bombarding enemy positions, and, working in conjunction with our artillery, he rendered them most valuable information.

CANADIAN FORCE.

Lt. Albert Edward Pickering, Infy. and R.F.C.

For conspicuous gallantry and devotion to duty when acting as an observer, in making reconnaissances at very low altitudes, and attacking hostile infantry, transport, and machines with great courage and determination. In conjunction with his pilot, he was instrumental in destroying several hostile machines, and in rendering valuable information to our artillery.

The King has been pleased to approve of the award of the Distinguished Conduct Medal to the following man for gallantry and devotion to duty in the field :—

8202 Sec. Cl. Air Mech. R. C. Cooper, R.F.C.

WAR OFFICE, July 27th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld. :—Sec. Lt. (temp. Lt.) R. S. Aitken, R.G.A., T.F., July 9th. Temp. Lt. H. A. Tweedie, Gen. List, April 10th, but without pay prior to July 12th.

SCHOOLS OF INSTR.—SCHOOLS OF MIL. AERONAUTICS.—Chief Instr.—(Graded as a Sqdn Comdr.).—Temp. Capt. H. C. Wakefield, Gen. List, a F'lt. Comdr., and to be temp. Maj. while so empld., vice Capt. (temp. Maj.) A. H. Jackson, Notts and Derby R., July 5th.

* * *

The names of the following have been brought to the notice of the Secretary of State for War for distinguished services rendered in connection with the war :—

Livingston, Maj. (temp. Lt.-Col.) G., C.M.G., Lond. R. and R.F.C.

Salmond, Maj. and Bt. Lt.-Col. (temp. Brig.-Gen.) J. M., C.M.G., D.S.O., R. Lanc. R. and R.F.C.

Valentine, Capt. (temp. Maj.) J., R.F.C., Spec. Res.

WAR OFFICE, July 28th.

MEMORANDUM.—Bt. Lt.-Col. (temp. Brig.-Gen.) J. M. Salmond, C.M.G., D.S.O., R. Lanc. R., to be temp. Maj.-Gen. whilst commanding a Training Brigade, R.F.C., June 22nd.

REGULAR FORCES.—STAFF.—ATTACHED TO HD.QR. UNITS.—Brig. Comdrs.—From Group Comdrs., R.F.C., and to be temp. Brig.-Gens. whilst so employed. :—Maj. (temp. Col.) H. C. T. Dowding, R.A. ; Bt. Maj. (temp. Col.) P. L. W. Herbert, Notts and Derby R., June 22nd.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Staff Officers, 1st Cl. —Graded for purposes of pay as A.A.G's., and to be temp. Lt.-Cols. whilst so empld. :—Capt. N. J. Gill, M.C., R.A., from the 2nd Cl. ; Lt. (temp. Capt.) F. C. Shelmerdine, Res. of Officers, from the 2nd Cl., June 22nd. Maj. A. L. Godman, D.S.O., York. R., from a Brig.-Maj., July 16th. 2nd Cl.—Graded for purposes of pay as Brig.-Majs.—Temp. Capt. V. W. Brown, M.C., Gen. List, from the 3rd Cl. ; Lt. (temp. Capt.) T. E. Longridge, A.S.C., from Adjt., and to retain his temp. rank whilst so empld., June 22nd.

Sqdn. Comdrs.—From Flt. Comdrs., and to be temp. Majs. whilst so empld. :—Lt. (temp. Capt.) S. W. Smith, R.A., March 12th. Capt. S. Grant-Dalton, D.S.O., York. R., but without pay or allowances prior to June 26th. Capt. A. R. Stanley-Clarke, M.C., Dorset R., May 1st. Capt. R. A. Archer, M.C., R.A. ; Sec. Lt. (temp. Capt.) R. J. Mounsey, Hamps. R., July 1st.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld. :—Temp. Lt. R. M. Drummond, Gen. List, May 25th. Lt. O. M. Sutton, S. Lan. R., Spec. Res., July 10th.

Spec. Appts. (Graded as Park Comdrs.).—From Equipment Officers, 1st Cl., and to be temp. Majs. whilst so empld., June 22nd :—Lt. (temp. Capt.) G. S. Peacock, Spec. Res. ; temp. Capt. N. F. D. Buckeridge, Gen. List ; Lt. (temp. Capt.) G. L. Main, Spec. Res.

Equipment Officers, 1st Cl.—From the 2nd Cl., and to be temp. Capts. whilst so empld., June 26th :—Temp. Lt. F. C. O. Shaw, Gen. List ; temp. Lt. G. E. Morris, Gen. List.

* * *

The King has been pleased to award the Military Medal for bravery in the Field to the following man :—

6705 1st Cl. Air Mech T. Reynolds, R.F.C.

WAR OFFICE, July 30th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld. :—Temp. Lt. A. N. Solly, Gen. List ; Sec. Lt. (temp. Lt.) A. T. Rickards, R.A., July 12th. Sec. Lt. J. Noakes ; temp. Sec. Lt. J. D. Atkinson, R.E., July 13th. Sec. Lt. A. S. Shepherd, Spec. Res., July 15th. Temp. Lt. G. K. Smith, Gen. List, July 17th.

NAVAL.

The following appointments have been made in the Royal Naval Air Service :—

JULY 25th.—Mr. J. H. Sayner granted a temp. commission as Lt. (R.N.V.R.), seny. July 24th.

JULY 26th.—Sub-Lt. (temp., R.N.V.R.).—A. E. Reed, promoted to Lt. (R.N.V.R.), seny. June 30th.

Temp. commissions (R.N.V.R.) have been granted to the following, seny. July 25th :—Lts.—T. M. Gerrard, E. J. Castell, H. O. P. Hammond, B. J. S. Brown, E. G. Millar, P. W. Goodchild, H. S. Kelly, S. P. Holloway, F. H. Stanton, C. F. Hannaford, and S. T. Buckland.

ADMIRALTY COMMUNIQUÉ.

JULY 30th.—During the night of the 28th inst. bombing raids were carried out by the Royal Naval Air Service on works at Bruges and in the areas of Thourout, Middelkerke, and Gistelles.

(*Continued on page* 325).

AERONAUTICAL ENGINEERING

SUPPLEMENT TO "THE AEROPLANE"

INCORPORATING AIRCRAFT ENGINEERING, AERODYNAMICS, AND MATTERS PERTAINING TO THE AERONAUTICAL ENGINEER AND THE AIRCRAFT TRADER

The British Aircraft Industry.

BY CHARLES L. FREESTON.

XXIV.—THE COWPER-COLES AIRCRAFT CO.

Quite unique among aeroplane producing firms is the *raison d'être* of the Cowper-Coles Aircraft Co., of Sunbury-on-Thames. The company is neither known to fame among pre-war designers nor as one of the many big manufacturing firms in either fields which have temporarily or permanently devoted their resources to the building of aircraft under the stress of war-time emergencies. But it is destined to transform the known riverside village of Sunbury-on-Thames, and probably make no small impression on the aircraft industry itself, by reason of the fact that it has embarked upon aeroplane production on totally new lines, in furtherance of inventions of proved value on the part of a scientist of repute.

Noteworthy Inventions.

Mr. Sherard Osborn Cowper-Coles is an engineer (both mechanical and electrical), a chemist, and a metallurgist, and has attained distinction in each of these several fields. His father was the famous Captain Cowper-Coles who invented the armoured turret for ironclads, and was awarded a C.B.

Devoting himself mainly to research and analytical work, Mr. Cowper-Coles has evolved two of his many processes of a particularly noteworthy character—one so far back as fifteen years ago, and the other much more recently. The first is "Sherardising," or the method of making steel and iron rustless, and the second is a system by which copper tubing can be produced by electrolytic deposits, with results that are nothing if not astounding in respect of strength and lightness.

Indeed, if one picks up a length of tubing of this type, one finds that it is all but impalpable, so extraordinary is its lack of weight; instead of consciously handling a piece of metal, the sensation that one derives is more akin to that of taking up a piece of tissue-paper, if that could be fashioned in tubular form.

Mr. Sherard Osborn Cowper-Coles.

A New Company

In aeroplane work it is obvious enough that rustless metal and light but strong tubing may each play a great part, and it was for this reason that Mr. Cowper-Coles formed some eight months ago the company which bears his name. Buildings were set up in the immediate neighbourhood of his charmingly situated house at Sunbury-on-Thames, and a considerable number of employees have been employed on two lines of work—the making of rustless metal parts and the building of aeroplane wings to the order of the Air Board.

Great Developments.

But much greater developments, of far-reaching extent, are now in progress. An estate of 33 acres, together with a large house containing 39 bedrooms, has lately been acquired and the said house will shortly be converted into offices and a hostel, while the estate will witness the uprising of large workshops devoted to aeroplane production on an important scale. The estate has a frontage, moreover, of 370 ft. on a backwater of the Thames, and here will be erected a seaplane shop and a launching stage on the river bank.

All-Metal Machines.

The type of machine in which the firm will specialise will be "all-metal," even as to the planes themselves, with metal struts and ribs, and sheet steel in lieu of the familiar fabric. Even the propellers will be of metal, and, as a matter of fact, their manufacture has already been begun.

Concurrently with the production of land and seaplanes will be carried on a large business in the making of parts of all kinds in rustless metal. Rust, as an enemy to be feared, is too well known to make it necessary to say more than that the future of the undertaking will be watched with more than ordinary interest.

A Remarkable Revival.

It may very naturally be asked why the process of Sherardising—so called after the inventor's first baptismal name—has suddenly, as it were, come into prominence at this juncture, albeit it has been in existence for a good number of years. For lately in the ironmongers' shops one has seen rustless cutlery on sale, and only a few days ago I saw some rustless golf clubs in the professional's shop at the links where I happen to play. But in the Royal Aero Club a short time ago the Sherardising process happened to come under discussion, and a member stated that he had had a set of rustless golf clubs for many years. Why, therefore, has the system lain dormant, or apparently dormant, for so long, and why do we witness this remarkable revival?

Mr. Cowper-Coles has provided me with the explanation. So far as the revival is concerned, that is due to the fact that the patents have expired, and certain cutlery manufacturers have been wise enough to take up the system.

As for the relatively small use that has been made of the process, that has simply been commensurate with the degree of energy devoted to the pushing of their system by the company which had the handling of the goods. Mr. Cowper-Coles himself, in fact, long ago parted with his patent rights in disgust because so little use was being made thereof. I am told that rustless golf clubs have been obtainable at one particular stores for many years, but though I have been playing golf for a dozen years I never saw implements of this kind until, as mentioned above, a few days ago.

Characteristic.

Now in this one field alone there was almost a fortune, with proper handling, for every golfer would appreciate the possession of a set of clubs which would not require perpetual cleaning. Every housewife, too, would welcome rustless knives if their advantages were properly impressed upon her notice; but the art of advertising has never been properly understood in England, and I for one doubt if it ever will. Pills and all manner of worthless abominations confront us right and left by advertisement suggestion, but oftener than not people who have the luck to get hold of a good thing do not understand the rudiments of the art of reaching the public.

In America, it may be added, large firms have taken up the Sherardising process, and Mr. Cowper-Coles was even awarded the distinction of the Scott medal for creating a new industry. And this, by the way, is not by any means the only example of America welcoming with open arms what has been given the cold shoulder in the country of its origin; indeed, one case might be mentioned which is intimately connected with aeroplane construction.

A Great Discovery.

Now that the Sherardising process, therefore, is destined to figure much more prominently than heretofore in the industrial world, it will not be out of place to describe its origin and its nature in detail. Scientifically it was referred to by its inventor as "vapour galvanising," and was discovered during the course of some experiments in connection with the annealing of cast iron.

It was found that zinc dust would volatilise, if in contact with another metal, at a much lower temperature than the ordinary melting point; in other words, a piece of iron placed in zinc dust, and heated to a temperature several hundred degrees below its melting point, would be quickly coated with zinc. Mr. Cowper-Coles was quick to realise the commercial possibilities of this phenomenon, and rustless metal came into being accordingly; though unfortunately, as has been pointed out, it has never been effectively exploited.

Some Advantages.

"The advantages of vapour galvanising are that it is cheaper than the ordinary hot galvanising, forms a better protection, and at the same time enables screw threads and machine work to be coated with an even distribution of zinc, and that the parts fit together and work quite freely, proper allowance having been made for the required thickness of the zinc."

The proof of this statement, which was made by the inventor to the Society of Chemical Industry, so far back as 1909, may be seen to-day by anyone who picks up a Sherardised screw at the Sunbury works; the threads are as sharp as if they had not been zinc-coated at all.

Novel Features.

One novel feature in connection with the process is that articles coated with grease receive as good a coating of zinc as those which are free from grease. This fact enables such articles as bolts, nuts, screws, etc., to be thrown direct, after machining, into the Sherardising drum without any cleaning or preparation whatever. The articles, when they have been heated in zinc dust for the period necessary to obtain the required thickness of zinc, can be removed whilst the zinc dust is still hot, although the better practice is to allow the zinc dust to cool to a temperature at which the articles can be readily handled, as the deposit of zinc is whiter and less oxide of zinc is formed.

Incidentally the process of dry galvanising offers many facilities and great economy to those manufacturers who have not sufficient work to keep a large bath of molten zinc continuously employed. Articles can be Sherardised at a few hours' notice, starting from cold, as the drums in which the zinc dust is volatilised can be heated by gas or coke furnaces, and the whole operation only occupies a few hours.

Valuable Properties.

Other very interesting features may be mentioned in connection with the process. Sherardised iron and steel are found in practice to withstand the ordinary corrosive agents to which galvanised iron is exposed to a remarkable degree, while even after the apparent removal of all the zinc by filing or abrasion the iron is still non-corrosive. This valuable property is believed to be due to the protective action of the zinc-iron alloy formed on the boundary line between the iron and zinc.

Another valuable feature is the fact that as Sherardising is effected at a very much lower temperature than hot galvanising, the temper of steel wire is not reduced as it is in the latter process. Steel and iron bolts, moreover, Sherardised at varying temperatures, have been found, when tested for tensile strength, to be equal to bolts which had not been Sherardised. The importance of these facts in connection with aeroplane work can hardly be over-estimated.

Art Metal Work.

Finally it may be stated, as a matter of interest, although not directly concerned with aircraft work, that there is a great future for Sherardising in connection with the inlaying and decorating of metallic surfaces; in America, in fact, this subsidiary feature has been extensively developed.

Mr. Cowper-Coles hopes, after the war, to found a village industry at Sunbury-on-Thames in this connection, and we shall certainly see the last of the egregious "art" metal work which has hailed from Germany. By the Sherardising process designs can be inlaid by the use of stencils, or an artist can draw his own design directly on the plate; hence the artistic possibilities of the system are illimitable. A great variety of effects can be obtained, and a number of metals can be blended which were formerly incompatible, while alloys of many colours and tints can be obtained in the one operation.

Meanwhile it remains to be seen what manner of machine emanates from the Sunbury workshops when they are in full blast, for there are "talking points" about an all-metal system which are too numerous to need particularisation.

USEFUL PREPARATIONS.

The National Chemical Works, Ltd., of Stanley Road, South Acton, market two chemical products, which should be of use to aircraft manufacturers, and also, in one case, to aeroplane pilots.

The first preparation is "Pulleystone," a paste intended for application upon the working faces of driving pulleys. The paste solidifies, forms a substance as hard as stone, and practically forms part of the pulley itself, and it is claimed that so treated the adhesive properties of the pulley are increased considerably.

It is also claimed that as the use of "Pulleystone" obviates the necessity for belt dressings, the fabric of the belt does not deteriorate, and that, therefore, increased life and power results.

The second preparation, which is of especial interest to aviators, is known as "Permanite." It is an adhesive cement of special qualities, which will cleave to iron, steel, brass, copper, aluminium, etc., even when highly polished. When set, it will resist the action of petrol, benzine, and the like, and also acid and chemical fumes. Before application, it is in the form of a paste, and is applied in a layer a sixteenth of an inch thick.

The makers suggest that "Permanite" would be useful to effect temporary repairs on petrol pipes and tanks in aeroplanes while in flight.

Among other useful purposes it can be employed in motor vehicles, for making oil-tight joints between cylinder block and crank case, or the joints between the top and bottom halves of the crank case to prevent leakage of oil.

"Permanite" does not expand or contract. It contains no organic matter, and, therefore, does not get decomposed. It is useful for petrol flange joints on pumps, etc., for water joints on gas engines. It resists a temperature of 1,100 degrees C., and over. It lasts indefinitely.

ALUMINIUM WELDING.

The acetylene welding of aluminium has always been a rather unsatisfactory job, chiefly because of the effect of high temperatures on this metal.

A proprietary article which claims to weld aluminium at a very low temperature is, therefore, of considerable interest.

This product is known as So-Luminum, and is handled by the So-Luminum Manufacturing and Engineering Co., Inc., of 1,790, Broadway, New York City, U.S.A.

So-Luminum is an alloy cast in sticks, which is used in very much the same way as the metal feed-stick used in the oxy-acetylene welding process. The difference is that an ordinary petrol torch is used, with a proportionately low temperature, and no flux is necessary.

It is claimed by the manufacturers that So-Luminum is the only metal which will satisfactorily solder aluminium, owing to the impossibility of keeping it free from oxidation, and they emphasise the point that the temperature at which a weld is possible is so low that there is no danger of burning, or of distorting the metal in any way.

The method of operation is to clean the job, heat it with a petrol blow-lamp, tin the surfaces to be joined up with So-Luminum, bring them together and re-heat.

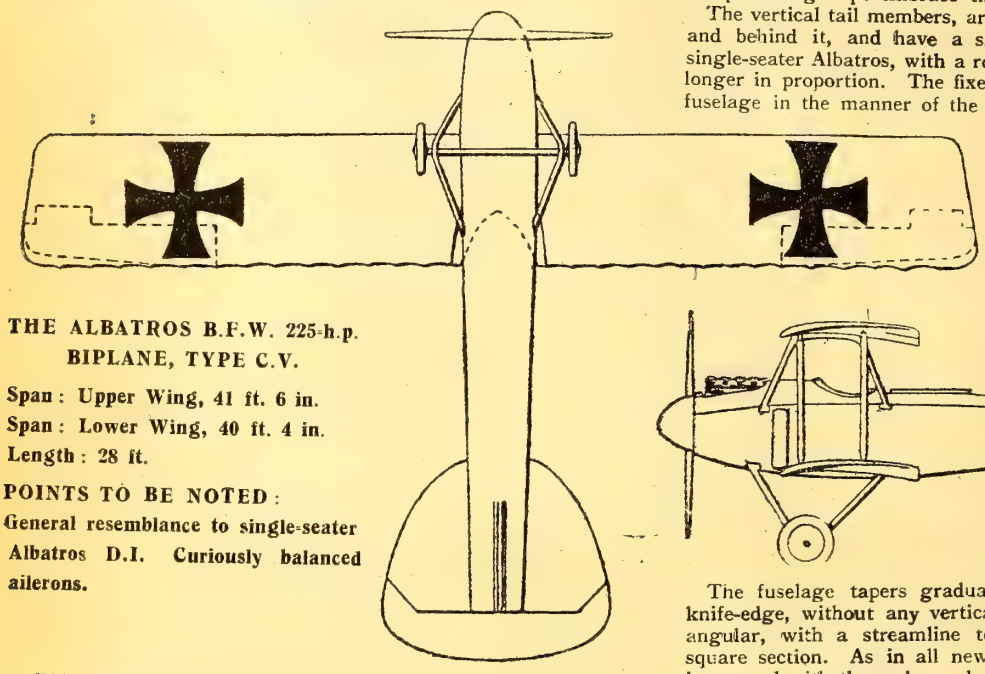
This material is used extensively by the U.S. Army and Navy, the International Motor, Packard, Pierce-Arrow, Studebaker, Locomobile, and kindred firms, so that its trial on this side seems warranted.

One user states that he mended a broken crank case with So-Luminum without removing it from the chassis, and without damage to the Babbit metal bearings. Inquiries, mentioning The Aeroplane, will receive prompt attention.

GERMANY'S MODERN AEROPLANES.

THE ALBATROS 225-H.P. TWO-SEATER BIPLANE.

The following description, translated from an article in "L'Aerophile," of June 15th, by M. Jean Lagorgette, is of interest, because it portrays a general purpose aeroplane which is typical of recent German practice.



THE ALBATROS B.F.W. 225-h.p. BIPLANE, TYPE C.V.

Span: Upper Wing, 41 ft. 6 in.
Span: Lower Wing, 40 ft. 4 in.
Length: 28 ft.

POINTS TO BE NOTED:
General resemblance to single-seater Albatros D.I. Curiously balanced ailerons.

This machine is in many respects similar to the Albatros single-seater. The machine examined by M. Lagorgette was constructed by the Bayerische Fleugzeug-Werke Gesellschaft, of Munich.

The span of this machine is 12.6 m. (41 ft. 6 in.), span of lower plane, 12.2 m. (40 ft. 4 in.); total length, 8.5 m. (28 ft.); total height, 3.3 m. (10 ft. 9 in.)

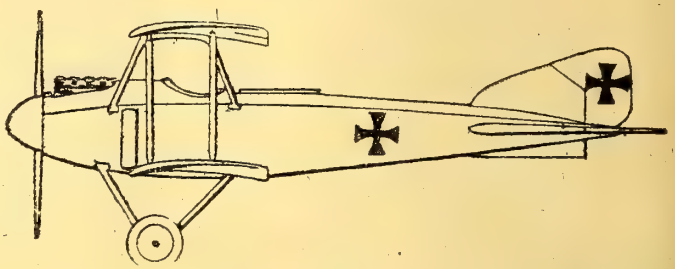
The wings are nearly equal in size. They are not staggered, and slightly trapezoidal. There are two pairs of steel tube interplane struts on either side. The ailerons do not project beyond the trailing edge. Instead, they taper gradually towards their outer edges. They are partly balanced, a compensating extension projecting into the wing, in front of the axis of the aileron, as can be seen in the diagram.

The gap between the wings is 1.8 m. (6 ft.)

The wings are constructed of wood in a manner similar to that of Albatros C.III and D.II.

The outline of the horizontal tail-plane is that of a rounded spade. The fixed plane is built in two halves, one on either side of the fuselage, is very thick, and is constructed of timber and covered with three-ply. The elevator is in one piece, and its two compensating flaps embrace the sides of the fixed plane.

The vertical tail members, are placed entirely above the fuselage and behind it, and have a similar appearance to those of the single-seater Albatros, with a rounded upper edge, but it is slightly longer in proportion. The fixed fin is permanently built into the fuselage in the manner of the Perry-Beadle flying-boat.



The fuselage tapers gradually until it becomes a horizontal knife-edge, without any vertical projection. The section is rectangular, with a streamline top. There are four longerons of square section. As in all new German aeroplanes, the fuselage is covered with three-ply, and varnished as in the C.III and other early models.

A revolving pot is attached to the propeller.

The landing carriage is ordinary: one pair of wheels and two steel tube Vs, the wheel base being 2 m. (6 ft. 7 in.)

There is a plough brake and an ordinary tail skid.

The motor is a fixed Benz of 225-h.p., which gives 1,415 r.p.m. It is not geared down. Two large and heavy radiators are placed one on either side of the fuselage. The petrol tank serves as the pilot's seat.

The armament consists of two machine-guns, one fixed on the side of the motor, and firing through the propeller, the other on a rear gun ring. Two bomb-releases are carried in the passenger's cockpit between the floor boards and the bottom of the fuselage.

THE A.E.G. SINGLE-ENGINED BIPLANE, TYPE C.IV.

The Allgemeine Elektrizitäts Gesellschaft, who, before the war, sold electric machinery in France, and is better known in English-speaking countries as the G.E.C., have constructed various large twin-engine aeroplanes with a single fuselage, as well as single-engined, biplanes

The biplane illustrated, as is the case of all machines built by this firm, is constructed entirely of steel tube autogenously welded, save for the greater part of the ribs and the leading edge of the wings. The lower wings have a span of 12.55 ms. (42 ft.), which is nearly equal to that of the upper wings, 13 ms. (43 ft.), the length of the machine is very small, being only 7.15 ms. (23 ft.).

The wings are set at a slight dihedral, namely, 2.5 degrees, or 125 mms. The centre section of the top plane, which is reminiscent of certain English machines, is supported by a splayed-out cabane, and there are two rows of interplane struts on either side.

The planes are washed out at the tips. Their incidence is 3 degrees for a little more than a third of the span, and 2 degrees near the external struts which diminishes still further towards the extremity of the wings.

The gap is 1.87 ms. at the front struts, and 1.89 ms. at the rear struts, and exceeds in an unusual manner the chord of the planes, which is 1.65.

The dimensions of the steel interplane struts are as follows:—the internal struts, 66 mms. by 31 mms.; the external struts, 62 mms. by 25 mms., and they are mounted at their bases on cones topped by balls.

The wing surface is 39.5 sq. ms. (260 sq. ft.), which includes the ailerons.

The wings are of trapezoidal form, but the ailerons have a peculiar form, their rear edge being very concave, which reminds one somewhat of the ancient Taube.

The wings and ailerons are entirely constructed of tube work, save for the leading edge and the secondary ribs in a manner similar to that which is found in the Rumpler. The main spars are of 40 mms. steel tube with tubular distance pieces, and the principal ribs are also made of flat tube work. In the lower wings there is arranged a pair of small tubes as guides for aileron cables. The trailing edge of the wings is formed by steel wire. There is a certain amount of flexibility in the trailing edge.

The ailerons are attached by three hinges to a false wooden spar, the surface of each being 5 sq. ms.

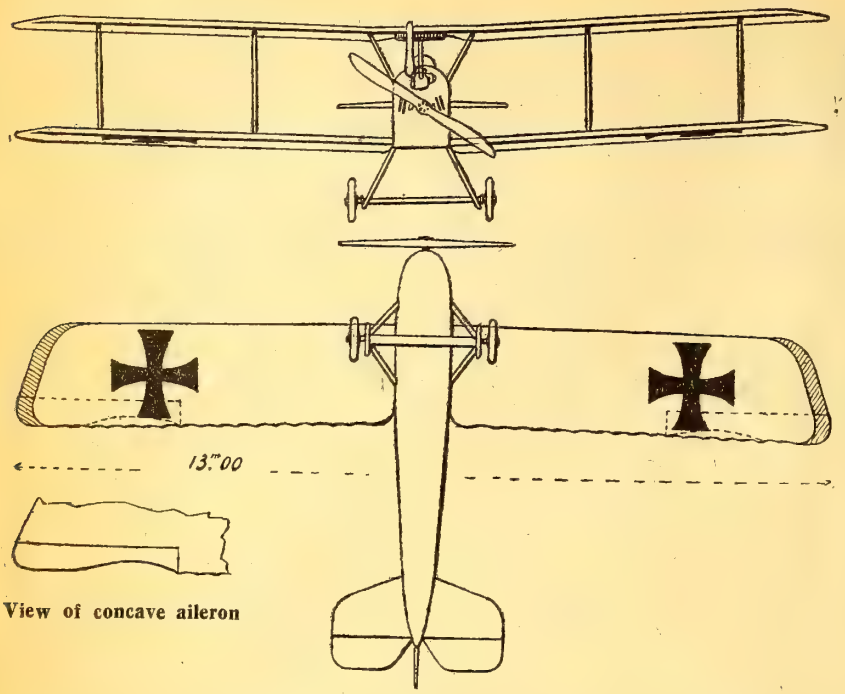
In each wing two of the cross anti-drift wires are cable and one a piano-wire, attached, as are those in the fuselage, by a link similar to those in the chain of a bicycle to lugs welded to the angles of the tubes. At their point of intersection they are joined in a manner similar to that employed in the bracing between the interplane struts, being in the form of an X à la Rumpler. The fabric is painted green and brown.

The elevator flaps have the appearance of a rounded polygon. The rudder, which is nearly triangular, is preceded by a fixed triangular fin. These controls are not balanced, a rather exceptional feature in a modern German aeroplane.

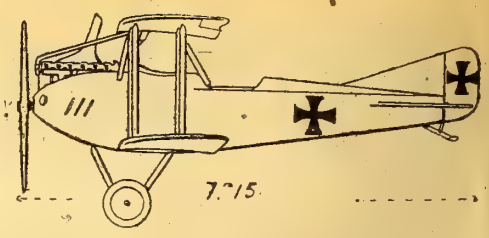
The fixed tailplane has a surface of 1.8 m. The elevators are 1.32 m. The fixed fin is 0.7 m., and the rudder is 0.63 m.

The angle of incidence is adjustable from 2.4 deg. to 4.55 deg.

The fuselage is constructed entirely of straight steel tubes, the surface thereof being slab-sided, but there is a rounded cowl in front, made of three-ply, with fabric on its sides. The streamline



View of concave aileron



A.E.G. TWO-SEATER BIPLANE, TYPE C.IV.

Span: Lower Wings, 42 ft.
Span: Upper Wings, 43 ft.
Length: 23 ft.
Engine: 175-h.p. Mercédès.

POINTS TO NOTE.

Splayed-out Cabane Struts.
Rudder extending to bottom of Fuselage.
Concave trailing edge to ailerons.

fairing on top of the fuselage is formed of three-ply placed on arches.

The two engine bearers, which are made of square steel tube, are supported in front each by two oblique tubes, placed one above, the other below.

The fuselage terminates suddenly at the rear with a vertical strut, and is overloaded with tubes and lugs. It is covered with fabric, which laces underneath.

Behind the motor is placed the pilot, who sits over the petrol tank, and behind him is the passenger's seat, which can be slid along a pair of "U"-shaped rails.

The landing carriage does not differ from others, except for its shock obsorbers, which consist of heavy coil springs (6 kgs.), which are attached to three long transverse steel members—an axle of 55 mm. diameter, and a distance piece in front and behind, all of which, together, make a streamline.

The tail skid is massive and well sprung.

The motor is a 6-cylinder Mercédès of 175-h.p.

The propeller is a "Wolf," 2.8 m. diameter and 1.8 m. pitch, constructed of alternate layers of ash and walnut, or walnut and mahogany.

An oblique funnel projecting from the fuselage makes it possible to replenish the petrol tank from the ground, without getting into the machine.

There is a water reservoir in the central section of the upper plane to the left of the axis of the machine. The radiator itself is of honeycomb type.

The exhaust pipes unite in a common vertical cylinder.

The armament consists of two machine-guns, one firing through the propeller, the other being placed in the passenger's cockpit.

There is a bomb-rack in the passenger's cockpit to take four bombs, placed one above the other.

THE HALBERSTADT FIGHTER.

"L'Aerophile" for June 15th also contains a dissertation by M. Jean Lagorgette upon the Halberstadt single-seater fighting biplane, type D.

M. Lagorgette states that the Halberstadt Company, of Halberstadt, modestly call themselves "cherished of the premier aviators of the war," and that their machines seem to be more in vogue on the British front than on the French front, if one can judge from the number which have been destroyed.

The single-seaters have a length of 7.3 metres (25 feet).

The upper plane has a span of 8.7 metres (28 ft.), and slightly larger than the lower plane (7.85 m.). The wings are set at a dihedral angle, are washed out, and are noticeably staggered, the lower wings being staggered 0.45 m., which assists the view ahead.

The wings are not swept back, and are nearly rectangular. The ailerons, which are on the upper planes only, project slightly, and are washed out, rising at the tips, as in other German biplanes. They are hinged on a secondary spar placed behind the rear main spar.

The chord of the wings is 1.56 m.; surface, 24.5 sq. m. (256.5 sq. ft.); gap, 1.3 m. The upper wings are not very distant from the top of the fuselage.

There are two pairs of interplane struts on each side of the fuselage, inclined towards the front. These struts are made of streamline tube, which terminate at their extremities in perforated heads, which are pinned between the walls of a fork joint fixed to the main spars, on which they pivot. In this way, the upper plane, by a movement through a parallelogram may, without the removal of struts, be folded in line with the lower plane, for ease in transport.

This system is all the more advantageous, because there is no necessity for readjustment when re-assembling; to release the cables, which operation is necessary, there is no need to unscrew the strainers, it suffices to unfasten the quick release attachments (similar to those in the L.V.G.), which connect certain cables to the bases of the interplane struts. Those cables, which do not have to be detached, are fixed to a ring contained in the base of the strut (as in the early Albatros).

This base is sloped by a block of wood to give it the inclination necessitated by the stagger of the wings.

The piano-wire cross bracing, which composes the internal strengthening of the wings, is fixed to long wiring plates, bolted to the inner surface of the spars. The main spars are of I section, and the cabane connects the upper pair with the fuselage. The centre section of the wings is covered with three-ply.

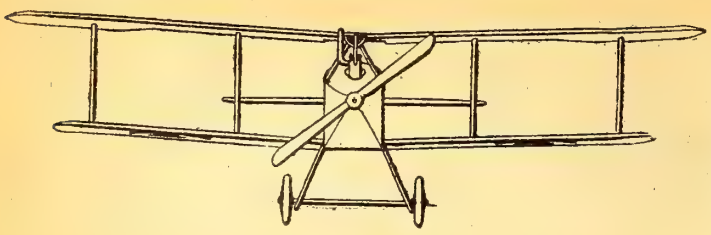
The lower spars terminate with a morticed butt, which meshes with a metal tenon built into the fuselage, and to which it is pinned by a bolt and cotter. This system, imitated from certain French machines, now tends to predominate in German aeroplanes, because it is very simple, and can easily be taken down, and is capable of manufacture on a larger scale than the older complicated attachments, specially constructed for each type of machine.

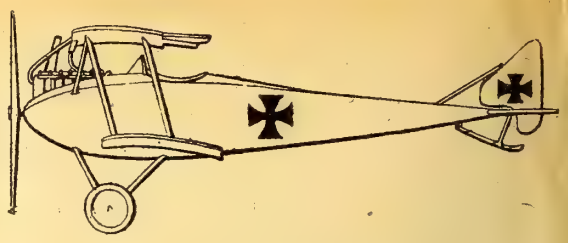
The section of the wing is well curved and very concave, as is common to all German machines even when intended for speed, and they are also very heavy. The trailing edge is rigid.

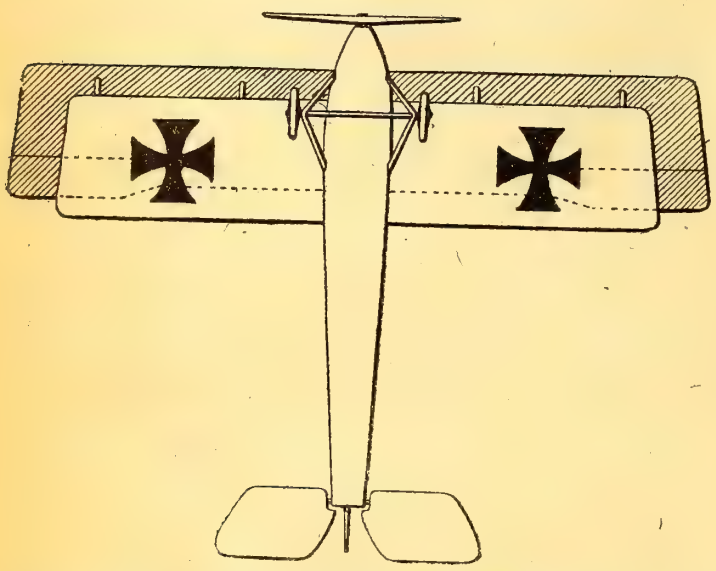
The control planes are similar to the early Morane, and without fixed surfaces. This absence is even more marked, and allows still more to be seen of the tapering fuselage, as the rudder is higher and more pointed, and stayed by two streamline tubes. It is placed almost entirely above the fuselage, and is not balanced below, as the balanced portion only appears on top. The shape of the balanced elevator is identical with that of the Morane.

Both rudder and elevators are built entirely of tube. The ribs in the elevators have internal "zig-zag" bracing. All the ribs are welded, both to the axle tubes and to the edges.

The fuselage is similar to that of the early Morane; it tapers horizontally backwards, and is of rectangular section.







THE HALBERSTADT FIGHTER, TYPE D.

Span: Upper Wings, 28 ft.
Span: Lower Wings, 27 ft.
Surface: 256 square ft.
Motor: 120-h.p. Argus.

POINTS TO NOTE.

Morane type control planes, without fixed fins.
External rudder post stays.
Slab-sided fuselage, with rounded top.
Square-cut planes, with projecting ailerons.

It is constructed of wood, with hollow spars, lapped with fabric, with cross struts so arranged that the longerons are not pierced, and the vertical and horizontal distance pieces being held in place by simple tin clips which encircle the longerons, but are bolted only to the distance pieces. Lugs extending from these clips serve as anchorages for the piano-wire bracing.

The cockpit is nearly central from front to back, and the upper longerons are nearly rectilinear. The fairing on top of the fuselage is in the form of a tapering bomb, which breaks off about halfway along the tail. It is formed of half hoops and laths.

The centre part of the fuselage is covered with fabric. The pilot is accommodated on a three-ply seat placed above the petrol tank.

The landing carriage is of usual type, a pair of streamline tube "Vs" united at their extremities by knee pieces.

The rear chassis strut is fixed underneath the rear lower main spar, where it unites with the fuselage longeron.

The tail skid of ash, pivots on a steel tube tripod, its front part being attached with a rubber cable, and the rear portion is shod with a metallic shoe.

The motor is usually a 120-h.p. Argus (a stationary vertical motor, with six cylinders linked by their water-jackets). The valves are placed on top of the cylinders, in line, and are operated, not by a camshaft, as on the Mercédès, but as on the Benz, by a vertical push-rod to each valve, placed on the left side of the engine.

The air inlet passes through a rectangular chamber placed underneath the carburettor.

The controls are of Fokker type. There is a vertical lever with two hand grips. A locking device makes it possible to stop the longitudinal action of the control lever, so that the pilot can leave both his hands free when he wishes to operate his guns.

The rudder-bar is fitted with stops to prevent the pilot's feet from slipping. All control wires are duplicated.

The armament consists of two machine-guns, firing through the propeller (until recently, there was a single Maxim). The action of these guns is made to synchronise with the rotation of the propeller, with the usual cam gear. Space is provided for 1,300 rounds.

THE ADVISORY COMMITTEE'S REPORT.

The report of the Advisory Committee for Aeronautics, of which Lord Rayleigh is president, was published last week. As usual, it is chiefly concerned with the glorification of the National Physical Laboratory. The following passages are of interest:—

The experimental investigations carried out under the control of the Advisory Committee for Aeronautics into the many problems affecting the development of aircraft have been continued and extended during the past year. Owing to the growth of the work of the Committee in certain directions, Sub-committees have been formed to advise in regard to special matters.

An Internal Combustion Engine Sub-committee has been appointed under the chairmanship of Dr. Dugald Clerk; Mr. Fowler is acting as chairman of a Light Alloys Sub-committee. Other Sub-committees have been constituted from time to time to investigate particular problems.

[One may supplement this statement by the remark that Dr. Clerk and Mr. Fowler are both practical men of proved merit, and their work on this Sub-committee is known to be of high value, as compared with much of the other operations of the Advisory Committee. It would be an excellent improvement if new designs for aero-engines were submitted to this Sub-committee instead of being turned down or boomed off by understrappers in the Air Board.—Ed.]

Many changes and developments in the design and construction of aircraft have taken place as the result of the continued and varied experience gained from their use in warfare under modern conditions. An increasing number of special problems is thus constantly presented for investigation, and these have very closely occupied throughout the year the attention of the staffs engaged in experimental work both at the National Physical Laboratory and at the Royal Aircraft Factory.

In addition to aerodynamical research, much attention has been given to questions relating to engines, materials of construction, strength of construction and design, instruments and accessories, as well as to methods of attack from aircraft and other matters.

[It may be well to point out that though the credit for all the discoveries in the directions indicated will doubtless be appropriated by Government officials, the great majority of the successful ideas, especially as regards engines, instruments, accessories, and methods of attack, come from active-service pilots and from the Aircraft Industry.—Ed.]

Stability and Kindred Questions.

With regard to aerodynamics, the experiments have been of very varied character, and have included tests of models of probably all types of aircraft at present employed. A large part of the work has arisen from specific inquiries proceeding from the Service departments, but progress has been made with some investigations of a more general character. Experiments have been carried out relative to the resistance of airship shapes, and further observations on the distribution of pressure in such cases have been made.

The investigation into the stability of the aeroplane has been continued. A number of special cases have been examined, and results of importance have been reached.

The theory of airship stability has also been investigated. Research into the nature of the flow of fluids round obstacles has been continued. Investigations relating to airscrews have been

The · Aeroplane ·

Acetylene Welding Plant—

Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—

Aircraft Manufacturing Co, Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation, Newcastle-on-Tyne."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2 City 7724.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.

Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."

Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."

Martinsyde, Ltd., Brooklands, Byfleet. Woking 331; Byfleet 171. "Martinsyde, Weybridge."

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455 "Nieuscout, Crickle, London."

Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."

The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. Putney 2240-2241, "Carbodis, London."

Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerfyta, Knights, London."

Waring & Gillow, Ltd., Hammersmith. Museum 5000. "Warisen, Ox, London."

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

White, J. Samuel, & Co., Ltd East Cowes. Cowes 3. "White, East Cowes."

Airships—

Airships, Ltd., High Street, Merton. Wimbledon 1314.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, 'Phone, London."

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Bizfibild, London."

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.

The Wilfley Co., Ltd., Salisbury House, London Wall, E.C.2 City 2681-2. "Wrathless, Phone, London."

Cable Coverings and Cable Controls—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Capstan Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Castings (Aluminium, Brass, Bronze, Machined or Rough)—

Coan, R. W., 219, Goswell Road, London, E.C.1 City 3846. "Krankases, Isling, London."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."

London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."

Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—

Accles & Pollock, Ltd. Oldbury, Birmingham, Oldbury 111 (4 lines). "Accles, Oldbury."

B. D. V. Aircraft Spares, Syon Chambers, 16a, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aeracracons, Canning, London."

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—

British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."

British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Clarke, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Elastic Cords—

Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—

Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. Midland 981. "Fahrenheit, Birmingham."

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—

E. Kalker & Co., Coventry. Coventry 241. "Kalker, Coventry."

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's E gineering Works, Bedford. Bedford 1. "Pump, Bedford."

Arrol-Johnston, Ltd., Dumfries. Dumfr 281-182. "Mocar, Dumfries."

The Beatty School of Flying, Ltd., The Broa way, Cricklewood, N.W.2. Hampstead 300

Beardmore Aero Eng., Ltd., 112, Great Po land Street, W.1. Gerrard 238. "Bea more, London."

Dudbridge Iron Works, Ltd. (Salmson), Victoria Street, London, S.W.1. Vic. 70 "Aeroflight, Vic., London."

Gordon Watney & Co., Ltd., Weybrid Weybridge 550 (7 lines). "Mercédès, W bridge."

Green Engine Co., Ltd., Twickenha Richmond 1293.

Gwynnes, Ltd., Hammersmith Iron Worl Hammersmith, W. Hammersmith 19 "Gwynne, Hammersmith."

The Selsdon Aero & Engineering Co., Lt Imperial House, Kingsway, W.C.2. Regent 11

Sturtevant, B. F., Co., Ltd., Hyde Park, Bost U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhan ton. Wolverhampton 985. "Moorfie Wolverhampton."

The Gnôme & Le Rhône Engine Co., Lt 47, Victoria Street, S.W.. Walthamst 408 (2 lines). "Elevenfold, London."

Willans & Robinson, Ltd., Victoria Worl Rugby. Rugby 112 (3 lines). "Willa Rugby."

Flexible Shafts—

Herbert Terry & Sons, Ltd., Redditch. R ditch 61. "Springs, Redditch."

Flying Schools—

Bournemouth Aviation Co., Ltd., Talbot V lage, Bournemouth. Bournemouth 11 "Etches, Winton."

Cambridge School of Flying & Aerodrome C Ltd., 30b, St. Andrews Street, Cambrid

Galvanising—

Boulton & Paul, Ltd., Rose Lane Works, N wich. Norwich 851. "Aviation, Norwic

Cowper-Coles Manufacturing Co., Sunbu on-Thames. Sunbury

Gears—

Moss Gear Co., Ltd., Thomas Street, Aste Birmingham. East 407. "Mosgear, Bir ingham."

Glue—

Improved Liquid Glues Co., Ltd., Gt. Hern tage Street, E. (Croid.). Avenue 31 "Excroiden, Wapp, London."

Mendine Co., 8, Arthur Street, E.C. Bank 58

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albema Street, Piccadilly, W.1. Regent 13 "Shatterlys, Piccy, London."

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, Lo Acre, W.C. Gerrard 1077 (3 line "Comyn, Ching, Westcent, London."

Chas. P. Kinnell & Co., Ltd., 65 & 6 Southwark Street, London, S.E.1. H 372 (2 lines). "Kinnell, London."

Instruments—

British Wright Co., Ltd., 33, Chancery La W.C.2. Holborn 13

Instruments (Scientific, Alt meters, Speed and Pressu Gauges, etc.)—

Short & Mason, Ltd., Macdonald Roa Walthamstow, E.17. Walthamstow 1 "Aneroid," Phone, London

Machine Tools—

Brewster & Co., 11, Queen Victoria Stree E.C.4. City 768. "Circumfuse, Canno London."

Magneto Driving Pieces—

Herbert Terry & Sons, Ltd., Redditch. Re ditch 61. "Springs, Redditch."

Magnetos—

The M-L Magneto Syndicate, Ltd., Victor Works, Coventry. 1008-1009 Coventr "Corlton, Coventry."

The British Lighting & Ignition Co., Ltd 204, Tottenham Court Road, W.1. Museu 430. "Vicksmag, Phone, London."

Metal Manufacturers—

Chas. Clifford & Sons, Ltd., Birmingham Central 42-43. "Clifford, Birmingham."

Metals in General—

Pritt & Co., 46, Fenchurch Street, Londo E.C.3. Avenue 995, 996, and 799 "Poetry, Fen, London."

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ɔtal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."
Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."
Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2297.
Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041. "Bayliss, Wolverhampton."
The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow, London. Hounslow 254. "Golshel, Hounslow."
Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. Museum 70. "Installing, Eusroad, London."
Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261. "Fremo, Birmingham."
Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."
Selsdon Engineering Co., Ltd., Croydon. Croydon 1761-123. "Selig, Cent, London."
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."
Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

ɔtal Shearing Tools—

Montgomery, Smith & Co., Ltd., Tangent Works, Keynsham, near Bristol. Keynsham 21. "Ingenuity, Salford."

ɔtal Spinnings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

ɔtric Bolts—

Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

ɔscellaneous—

Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."
Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C. Central 3731.
Bowdon Wire, Ltd., Willesden Junction. Willesden 2400 (3 lines). "Bowirelim, Harles, London."
Brown Bros., Ltd., Great Eastern Street, E.C.1. London Wall 6300. "Imbrowned, Bethroad, London."
Edison Swan Electric Co., Ponder's End. (Lamps). Enfield 520 (6 lines). "Ediswan, Enfield."
Herbert Frood Co., Ltd., Chapel-en-le-Frith. Central 793. "Frodobrake, Birmingham."
Glasso Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.
London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

ɔtor Cars—

Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
Standard Motor Car Co., Coventry. Coventry 530 (4 lines). "Flywheel, Coventry."

ɔbservation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

ɔackers, Shippers, Etc.—

Lep Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depolep, London."

ɔatent Agents—

King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.
Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.
Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

ɔetrol Storage (Bulk)—

Bywater & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. Gerrard 2220. "Bywaterist, London."

ɔiston Rings—

British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—

Bliss, E. W., Co., 2a, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissdon, London."

Presswork—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."
Integral Propeller Co., Ltd., Hendon 9. Kingsbury 104. "Aviprop, Hyde, London."
Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."
Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Stanley Aviation Co., 67, Kingsland Road, E.2. City 8347.
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—

C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. Chapeltown 474. "Instrument, Leeds."

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The Norman Thompson Flight Co., Ltd., Middleton, Bognor Bognor 48. "Soaring, Bognor."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Short Bros., Rochester, Chatham 627. "Seaplanes, Rochester."
Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Shackles—

The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. Hounslow 254. "Golshel, Hounslow."

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.
Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."
The Selsdon Aerol & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sheet Metal Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Shock Absorbers (Elastic Cord)—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—

Forward Motor Co., Summer Row, Birmingham. Central 6259.
Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.
Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."
Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—

Dart Spring Co., West Bromwich. West Bromwich 322 "Dart, West Bromwich."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—

Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."
Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—

Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—

John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.
James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London."
R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."
The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Weskent."

Varnishes—

Clarke, R. Ingham, & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."
Harland, W., & Son, Merton. Wimbledon 45.
Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."
Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Washers—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Watchmakers and Jewellers (Silver Models)—

Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—

Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."
London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—

Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wiremill, Musselburgh."
Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Wirework—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Woodworking Machinery—

Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."
Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."
Wadkin & Co., Leicester. Leicester 3614. "Woodworker, Leicester."

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Acetylene Welding Plant—
Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—
Aircraft Manufacturing Co., Ltd., Hendon, Kingsbury 180. "Airmanship, Hyde, London."

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation, Newcastle-on-Tyne."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2 City 7724.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.

Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7440. "Hydrophid, Crickle, London."

Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."

Martinsyde, Ltd., Brooklands, Byfleet. Woking 331; Byfleet 171. "Martinsyde, Weybridge."

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455 "Nieuscout, Crickle, London."

Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."

The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. Putney 2240-2241, "Carbodis, London."

Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough, Peterborough 128. "Sage, Peterborough."

Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2., City 89. "Gunsignrush, Estrand, London."

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerfyta, Knights, London."

Waring & Gillow, Ltd., Hammersmith, Museum 5099. "Warisen, Os, London."

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

White, J. Samuel, & Co., Ltd East Cowes. Cowes 3. "White, East Cowes."

Airships—
Airships, Ltd., High Street, Merton. Wimbledon 1314.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Aluminium Castings—
Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—
Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 905, 906 and 7906. "Poetry, Fen, London."

Bearings (Etonia Cast Phosphor Bronze)—
Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3027 "Yes, Leeds."

Buildings—
Boulton & Paul, Ltd. Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Bizfibild, London."

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.

The Wolfley Co., Ltd., Salisbury House, London Wall, E.C.2 City 2681-2. "Wrathless, Phone, London."

Cable Coverings and Cable Controls—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Capstan Work—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Carburettors—
Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1 Victoria 4670.

Castings—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217 "Lucraftia, London."

Castings (Aluminium, Brass, Bronze, Machined or Rough)—
Coan, R. W., 219, Goswell Road, London, E.C.1 City 3846. "Krankases, Isling, London."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Willans & Robinson, Ltd Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—
Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—
Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."

London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—
Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."

Hazel & Co., 4, Princes Street, Hanover Square, W.1 Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—
Accles & Pollock, Ltd. Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."

B. D. V. Aircraft Spares, Syon Chambers, 162a, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aerocranes, Canning, London."

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—
MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—
British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."

British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellulate, London."

Cellon, Ltd., Broad Street House, New Brond Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Clarke, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Elastic Cords—
Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—
Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. Midland 981. "Fahrenheit, Birmingham."

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—
E. Kalker & Co., Coventry. Coventry 248. "Kalker, Coventry."

Engines and Parts—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford No. 1. "Pump, Bedford."

Arrol-Johnston, Ltd., Dumfries, Dumfriesshire. 281-282. "Mocar, Dumfries."

The Beauty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3010.

Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. Gerrard 258. "Beardmore, London."

Dudbridge Iron Works, Ltd. (Sallows), Victoria Street, London, S.W.1. Victoria 7118. "Aeralight, Vic, London."

Gordon Watney & Co., Ltd., Weybridge. Weybridge 550 (7 lines). "Merc[illegible], Weybridge."

Green Engine Co., Ltd., Twickenham, Richmond 1293.

Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. Hammersmith 1200. "Gwynne, Hammersmith."

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2 Regent 1181.

Sturtevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Manfred, Wolverhampton."

The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W., Walthamstow 408 (2 lines) "Elevenfold, London."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Flexible Shafts—
Herbert Terry & Sons, Ltd., Redditch, Redditch 61. "Springs, Redditch."

Flying Schools—
Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. Bournemouth 168. "Etches, Winton."

Cambridge School of Flying & Aerodrome Co., Ltd., 30b, St. Andrews Street, Cambridge.

Galvanising—
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Cowper-Coles Manufacturing Co., Sunbury-on-Thames. Sunbury 5.

Gears—
Moss Gear Co., Ltd., Thomas Street, Lozells, Birmingham. East 407. "Mosgear, Birmingham."

Glue—
Improved Liquid Glues Co., Ltd., Gt. Bentage Street, E. (Croid.). Avenue 378. "Excroiden, Wapp, London."

Mendine Co., 8, Arthur Street, E.C. Bank 4[illegible].

Goggles—
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Heating and Ventilating—
Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines). "Comyn, Ching, Westcent, London."

Chas. P. Kinnell & Co., Ltd., 65 & 66, Southwark Street, London, S.E.1. Hop 372 (2 lines). "Kinnell, London."

Instruments—
British Wright Co., Ltd., 33, Chancery Lane, W.C.2. Holborn 798.

Instruments (Scientific, Altimeters, Speed and Pressure Gauges, etc.)—
Short & Mason, Ltd., Macdonald Road, Walthamstow, E.17. Walthamstow 180. "Aneroid," Phone, London

Machine Tools—
Brewster & Co., 11, Queen Victoria Street, E.C.4 City 768. "Circumfuse, Cannon, London."

Magneto Driving Pieces—
Herbert Terry & Sons, Ltd., Redditch, Redditch 61. "Springs, Redditch."

Magnetos—
The M-L Magneto Syndicate, Ltd., Vicarage Works, Coventry. Coventry 1208-1009 "Corlton, Coventry."

The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. Museum 430. "Vicksmag, Phone, London."

Metal Manufacturers—
Chas. Clifford & Sons, Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

Metals in General—
Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 905, 906, and 7906. "Poetry, Fen, London."

Metal Parts and Fittings—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."

Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."

Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2297

Baylies, Jones & Baylies, Ltd., Wolverhampton. Wolverhampton 1041. "Bolts and Nuts."

"Baylies, Wolverhampton."

The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. Hounslow 254. "Golshel, Hounslow."

Brot, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. Museum 70. "Instalting, Euroad, London."

Broomford, Fredk., Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261. "Fremo, Birmingham."

Robert, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roots, Darlaston."

Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."

Selsdon Engineering Co., Ltd., Croydon. Croydon 1701-123. "Selig, Cent, London."

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aerocranes, Canning, London."

Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

Metal Shearing Tools—
Montgomery, Smith & Co., Ltd., Tangent Works, Keynsham, near Bristol. Keynsham 21. "Ingenuity, Salford."

Metal Spinnings—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Metric Bolts—
Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

Miscellaneous—
Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."

Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C. Central 3731.

Bowden Wire, Ltd., Willesden Junction. Willesden 2400 (3 lines). "Bowirelim, Harles, London."

Brown Bros., Ltd., Great Eastern Street, E.C. London Wall 6300. "Imbrowned, Rothrad, London."

Edison Swan Electric Co., Ponder's End, Hampshi. Enfield 520 (6 lines). "Ediswan, Enfield."

Herbert Frood Co., Ltd., Chapel-en-le-Frith. Central 703. "Frodobrake, Birmingham."

Glass Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.

London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."

MacLennan, J., & Co., 30, Newgate Street, E.C.1, and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—
Arrol-Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."

Standard Motor Car Co., Coventry. Coventry 538 (4 lines). "Flywheel, Coventry."

Observation Panels—
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Packers, Shippers, Etc.—
Lep Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depolep, London."

Patent Agents—
King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.

Page & Rowlington, 27, Chancery Lane, E.C.4. Central 332.

Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Petrol Storage (Bulk)—
Bywater & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. Gerrard 2220. "Bywaterist, London."

Piston Rings—
British Churk & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—
Bliss, E. W., Co., 2a, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissdon, London."

Presswork—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Propellers—
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."

Integral Propeller Co., Ltd., Hendon 9, Kingsbury 104. "Aviprop, Hyde, London."

Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."

Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Stanley Aviation Co., 67, Kingsland Road, E.2. City 8347.

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

Rigging for Aircraft—
Cradock, G., & Co., Ltd., Wakefield, England Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—
The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—
C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—
Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—
The Foster Instrument Co., Letchworth, Herts. Chapeltown 474 "Instrument, Leeds."

Seaplane Manufacturers—
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

The Norman Thompson Flight Co., Ltd., Middleton, Bognor Bognor 48. "Soaring, Bognor."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Short Bros., Rochester, Chatham 627. "Seaplanes, Rochester."

Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—
Bowser, E., Art Cane Works, 50, Park Lane, Leeds Central 3473.

Shackles—
The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. Hounslow 254. "Golshel, Hounslow."

Sheet Metal Pressings—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.

Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sheet Metal Work—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Shock Absorbers (Elastic Cord)—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—
Forward Motor Co., Summer Row, Birmingham. Central 6259.

Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."

Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. Gerrard 3758. "Ripault, Reg, London."

Springs—
Dart Spring Co., West Bromwich. West Bromwich 322 "Dart, West Bromwich."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—
Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237 "Firth, Sheffield."

Nicklin, Bernard, & Co., Birmingham, Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—
Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Steel Tubes for Aeroplanes—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—
Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—
John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

James Nerth Hards & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—
Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073. 4210. "Entikosil, Vic, London."

R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—
Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—
The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 123-126. "Beldam Tyres, Brentford."

The Palmer Tyre, Ltd., Shaftesbury Avenue, Gerrard 1214 (4 lines). "Tyricord, Westkent."

Varnishes—
Clarke, R. Ingham, & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Harland, W., & Son, Merton, Wimbledon 45.

Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."

Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Washers—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Watchmakers and Jewellers (Silver Models)—
Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—
Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—
Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."

London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—
Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wiremill, Musselburgh."

Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Wirework—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Woodworking Machinery—
Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."

Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."

Wadkin & Co., Leicester. Leicester 3614. "Woodworker, Leicester."

carried out, with a view to increasing the accuracy of prediction of performance, and thus facilitating the design of airscrews for special purposes. Tests on screws to be used as windmills for the production of power have also been made

[This last is particularly interesting in view of the N.P.L's. refusal to reply intelligently to Mr. G. W. Goodchild's letters on the subject. Reference should be made to the correspondence between Mr. Goodchild and the N.P.L., which was published in this paper recently.—Ed.]

The work has included a complete series of tests on more than one complete aeroplane model. The information thus derived is of considerable importance for practical purposes in aeroplane design.

CONSTRUCTIONAL STRENGTHS

Questions relating to strength of construction have been investigated, and some general conclusions have been reached tending to simplification of strength calculations. The basis to be adopted in design to secure adequate strength in high speed machines, with the power of rapid manœuvring essential in aerial fighting, is a matter demanding the most careful consideration.

To secure the highest possible speed it is necessary to keep down the weight to a minimum, and the best compromise between these two opposed conditions does not admit of precise determination. This question has received attention, and the manner in which strength varies with increase of dimensions has also been made the subject of investigation. Cases in which vibration has been set up have been examined, and calculations relating to the strength of the body structures have been made.

[Yet, curiously enough, no official person seems to have realised yet that a true monocoque body is the best of all body structures.—Ed.]

The use of light alloys in the construction of aircraft and aircraft engines is becoming of rapidly increasing importance, and improvements in the production of light alloys will have great effect on future development. The investigations relating to light alloys, which have been in progress for many years at the National Physical Laboratory, have been continued, and results of special interest have been achieved during the past year.

[Thanks to the efforts of commercial metallurgists and not to the N.P.L.—Ed.]

Suggestions have been made to the Air Board by the Committee which may, it is hoped, help to secure the best conditions in manufacture for the development of such alloys. The formation of the Light Alloys Sub-committee will be of great assistance in co-ordinating the work on light alloys which is being done in various quarters, and in collecting the information resulting from experimental investigation and manufacturing experience.

Experimental work has been carried out for the Sub-committee at the Royal Aircraft Factory, the University of Birmingham, the National Physical Laboratory, and elsewhere, and arrangements have been made for placing the information obtained at the disposal of manufacturers.

[One hopes that the information will actually be placed at the disposal of manufacturers and that clever young officials will not store up tit-bits of information for use to their own advantage when opportunity arises.—Ed.]

ACCESSORIES BEFORE THE FACT.

A number of special questions have arisen for investigation in relation to airship and aeroplane fabrics. A large amount of attention has been given to materials for use as dopes, varnishes, etc., and the Laboratory has collaborated with the Military Air Department in an investigation into the behaviour of fabrics, dopes, and protective coatings under the conditions of tropical exposure. The results of exposure to ultra-violet radiation have been studied in relation to the effect of sunlight, and conclusions of importance have been reached.

[Meantime, production has been hindered, because the microscope merchants have hung up perfectly good material during their pleasure. Ordinary practical experience of fabric and dope, and varnish and glue counts for little alongside the pseudo-science of the official mind.—Ed.]

SPECIAL QUESTIONS.

Tests on models of seaplane floats in the William Froude National Tank have been continued and extended. The provision made last year for an increase in the staff available for carrying out this work has enabled more rapid advance to be made, and a number of important questions have received attention. The methods employed have been improved and elaborated, and new apparatus has been designed whereby additional measurements can be obtained and further information secured relative to special conditions arising in practice.

[If some of these able-bodied young men were to take a course of experimental work in motor-tanks at the front they would probably confer greater benefits on their native land, and might even enrich the land in which they would probably remain.—Ed.]

As usual, a large number of special questions have been referred to the Committee for advice or investigation. The experiments relating to bombs have been continued, and valuable communications relative to the flight of bombs have been received from the Air Department of the Admiralty and from the Central Flying School.

Questions relating to the attack of aircraft from aircraft have been examined.

[One can well believe that the Advisory Committee has been handling the question, if the effects of recent attacks on German air raiders may be taken as evidence. The lamentable lack of results distinctly suggests that the Military Authorities have been taking the Committee's Advice, much as the present lack of aeroplanes and engines is the result of taking the Committee's Advice in the past.—Ed.]

Problems in connection with the aeroplane compass have been further considered. Other instruments and apparatus for use on aircraft have been investigated.

As previously, a number of inquiries have been received from the Board of Invention and Research and the Munitions Inventions Department, and investigations have been carried out at their request at the National Physical Laboratory and at the Royal Aircraft Factory. A number of communications have been received during the year relating to experimental work carried out by the R.N.A.S., and by the Testing Squadron of the Royal Flying Corps. Many of these have been of great interest and value, and of much assistance in the application of the results obtained from the model experiments and in the estimation of aeroplane performance.

[One would like to make a substantial bet that the N.P.L. has learnt many times as much from the Test Squadron R.F.C. than the Test Squadron has learnt from the N.P.L.—Ed.]

EXPERIMENTS AT THE ROYAL AIRCRAFT FACTORY.

Much research has been made into various methods for improving the output and the reliability of aeroplane engines. A large number of radiators of various types have been tested, and an efficient type has been standardised. Great progress has been made in the development of the air-cooled engine.

[Has the official development approached the A.B.C. effort yet?—Ed.]

Work has been done on the compensation of carburettors for variation of air density and a device for improving the performance of engines at great heights has been tested on several engines.

The measurement of the resistance of aeroplanes in flight has been continued with the object of confirming the model experiments and an instrument for measuring the resistance directly has been developed.

Measurements have also been made of the disturbance of the air behind a propeller to obtain data which are required in the design of new machines.

[One commends to attention the study of the front end of German machines with a view to getting better efficiency from propellers.—Ed.]

The behaviour of various types of magnetic compass in an aeroplane in flight has been investigated.

Two new types of bombsight have been developed, and are now being tested.

The improvement of the standard aeroplane instruments has been continued, and a number of special instruments have been devised for use in connection with full scale experiments on aeroplanes.

The means of communication between pilot and observer have been improved.

Experimental work in meteorology has been mainly in connection with the inquiry into the location of distant thunderstorms and the tracing of their progress across the map by means of a properly organised system of observations at various stations.

[Has anyone thought of employing our anti-aircraft observation posts on this job? There seems to be a distinct possibility in this direction.—Ed.]

AIRCRAFT PARTS.

The Albany Forge, Ltd., which is in association with W. E. Whiteside and J. Caslake, Ltd., whose works are at 45, Goldhawk Road, Shepherd's Bush, W., has commenced the manufacture of aircraft parts. This department is under the control of Mr. W. Lovelace Osborne, who has had considerable experience in aircraft work.

The firm is open to undertake further contracts for the manufacture of all kinds of component parts, particularly in sheet-metal-work and welding.

A REINFORCEMENT.

It is announced that the Board of J. Samuel White and Co., Ltd., of East Cowes, I.W., has been augmented by the appointment of Sir James B. Marshall, K.C.B., as Deputy-Chairman.

Sir James Marshall's appointment cannot fail to increase the utility and prosperity of this extremely strong and well-established firm. Mr. A. J. Carnt, brother of the late Chairman, is now Chairman of the Board.

Triplex Safety Glass.

A schoolgirl who was told to write an essay upon "Pins" evolved the following:—

"*Pins have saved thousands of lives.*"

Asked for an elucidation of this extraordinary brain-wave, she rejoined:—"By people not swallering 'em"!

On this analogy it might be averred that plain glass has saved thousands of lives—by people not using it on motor-cars and aeroplanes. Unfortunately, a great many people still go on using it, at no small risk to themselves—a risk which is expressed in practical shape by the fact that insurance companies will quote a lower premium to the car-owner who uses Triplex Safety Glass than to those who have taken no such salutary precaution.

As a matter of fact, Triplex Safety Glass has proved its value in such unmistakable fashion that to avoid its use until an accident forces its necessity in painful fashion is only one degree less fatuous than to refuse to take out an insurance policy until the first mishap has occurred.

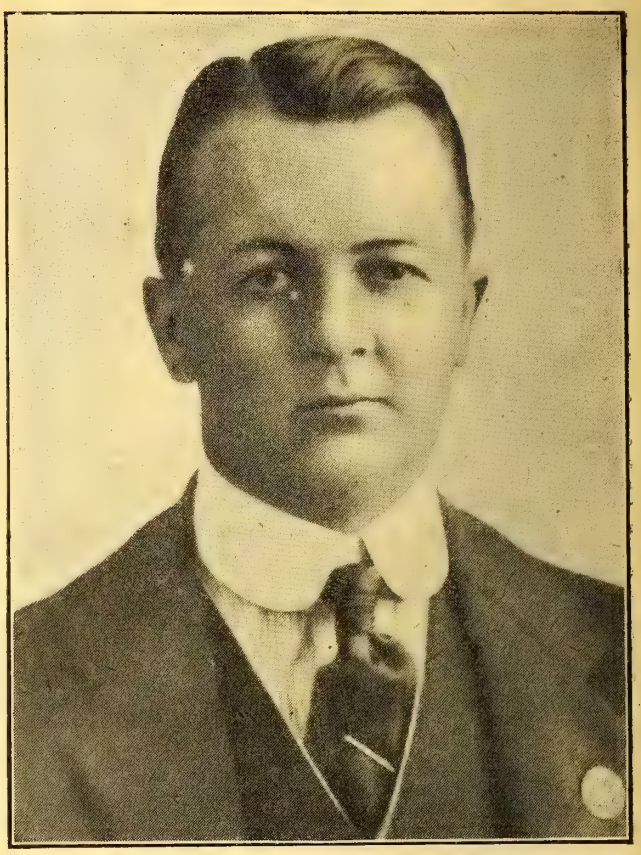
Quite an interesting collection of trophies, which is almost daily being augmented, may be seen at the show-rooms of the Triplex Safety Glass Co., 1, Albemarle Street, W., in the shape of various goggles and gun-shields that have saved the eyes and perhaps the lives of aeroplane pilots. It may be doubted if anything more convincing in the way of ocular demonstration could be imagined than a lens cracked by a shrapnel bullet which would assuredly have pierced a piece of plain glass. Small wonder is it, therefore, that Triplex goggles are officially served out as a necessary item of a pilot's equipment. As for screens, they too are officially regarded as indispensable, and, so far from weight being a barrier, one may even see a fitting of this kind, R.A.F. pattern, which does not exceed six ounces.

The latest development, by the way, in the use of Triplex glass opens up new possibilities. Everyone knows the value of tinted goggles for eye-resting purposes; but what everyone does not know is that the number of tints which can be imparted to plain glass is strictly limited. On the other hand, the xylonite insertion which is an essential feature of the Triplex method can be invested with any colour, and lenses and screens are now available in tints that are more grateful in actual use than those which are more ordinarily obtainable.

Another recent use of Triplex glass is in connection with hand mirrors, which are therefore unbreakable. A benefit of a practical kind is not only thus conferred, but the feelings are thereby spared of those who regard the cracking of a looking-glass with superstitious fears.

As a matter of fact, the purposes to which Triplex Safety Glass may be applied are wellnigh unlimited; it can and may eventually supersede the use of the plain article in every direction, save only where a flat surface is not employed. This one limitation, of course, is due to the manufacturing process. A thin sheet of xylonite is inserted between two sheets of glass and treated with several coats of adhesive mixture, hydraulic pressure being then applied until the product is all but homogeneous; but a plane surface is obviously essential.

Undoubtedly a number of new uses for Triplex glass will be found after the war, but even now they are numerous, and range from goggles to 8-ply panels, 5 inches thick, for armoured cars, and 5-ply panels for ship look-outs. One of the 8-ply panels, by the way, was officially tested with a Mauser rifle at 25 yards, using German ammunition, and was found proof both normally and reverse. The bullet, indeed, was simply absorbed, as it were, by the glass, being reduced to fine particles. Even an ordinary motor-car screen, hit by eight shrapnel bullets, has been known to stop seven, while the eighth only just got through.



Mr. Reginald G. M. Delpech.

For burglar-proof purposes, moreover, Triplex Safety Glass is invaluable, as a burglar cannot get through a glass door by the ordinary method of using a diamond cutter. Even if he could cut a Triplex pane on both sides he would still be unable to break it, while in reality he would only have access to it from one side.

Where delicate instruments, too, are concerned, the use of Triplex glass confers material advantages, as the indicators can be printed on the xylonite and thus be under protection.

The story of how Triplex Safety Glass came to be manufactured in this country is not without interest. Invented by a Frenchman, M. Benedictus, it was introduced to Mr. Reginald G. M. Delpech one morning when, as it happened, he had met with a serious accident only the night before. The taxicab in which he was being driven was charged by a motor-car, head on, with the result that he had numerous cuts on the head and an ear nearly torn off. Mr. Delpech realised the possibilities of the invention at once, and straightway went over to Paris to secure the British and Colonial rights, since when the business which he established for the manufacture of Triplex Safety Glass has gone ahead in remarkable and constantly increasing fashion.

ON PRACTICAL COSTING.

A small handbook is about to be published by Mr. Arthur H. Gledhill, A.M.I.M.E., of the Gledhill-Brook Time Recorders, Ltd., entitled "Practical Costing."

An advance copy of this handbook makes interesting reading, setting forth, as it does, a system for the complete control of a works output by the use of the Gledhill-Brook card and time clock recording scheme.

The author points out that a costing system should point out four things, namely:—

(1) Reveal what profits and losses have been made in each department, thereby showing their relative efficiency.
(2) Form a basis for estimating.
(3) Form a manufacturing profit and loss account.
(4) Show losses on occupied floor space, and idle machinery.

The following important problems are dealt with, and a solution is given to their satisfactory accomplishment.

(1) Routine necessary to start a job.
(2) Time records.
(3) General labour costs.
(4) Hourly rates (labour).
(5) Stores and Materials.
(6) Overhead manufacturing expenses.
(7) Selling expenses.
(8) Final summaries of costs.
(9) Balancing cost accounts with commercial accounts.
(10) Weekly departmental account.
(11) Manufacturing in multiples of 60.
(12) Costs and estimates.
(13) Bonus for increased output.

Such a very comprehensive work, written by an expert on his subject, should be in the hands of everyone concerned with manufacturing.

The price of the handbook will be 3s., and it will be ready for sale in a few days.

Applications should be addressed to the Gledhill-Brook Time Recorders, Limited, 26, Victoria Street, Westminster, S.W.

MARKET REPORTS.

26/7/17.

The object of these reports, as the majority of readers know, is to record fluctuations of the Market Prices of Aircraft Materials, the causes influencing the prices, and as far as possible to record expected fluctuations. It is therefore unnecessary to plead pardon for commenting upon the most recent and very drastic regulations issued by the Air Board for controlling Aircraft Materials.

The regulations issued by the Director of Aeronautical Supplies, dated July 19th, are as follows:—

The following regulations regarding sub-contracting will be included as a condition of any future contracts. As regards current contracts you will adopt this procedure for any further sub-contracts you may propose to place.

Sub-contracts.—Sub-contracts shall be placed only with the written permission of:—

(a) The Controller of Aeronautical Supplies (S.M.A.) for

Irons	A.G.S. Parts
Steels	R.A.F. Wires
Non-ferrous Metals.	Stampings
Crankshafts	Pressings
Cables	Tubes (other than Steel)
Wires	Timber
Dope	Chemicals
Fabric	Steel Tubing
Canvas	

Advice as to the most suitable firms from which to order material for the purpose of this contract may be obtained from the Controller, application being marked (S.M.A.)

(b) The Director of Inspection for:—
Manufactured Details generally, other than those excepted in (a) above.

(c) Application for permission to sub-contract complete Units such as Planes, Tail Units, Fuselages, etc., must be made to The Director of Aeronautical Contracts.

All such applications must show specifically what items and what quantities it is proposed to sub-contract, with the full address of the firms proposed.

The above regulations are very sweeping, and cannot be considered a wise step, if acceleration and colossal increase of output is the chief ambition of the Air Board officials.

Manufacturers have already suffered very greatly by a similar control affecting Machine Tools. No doubt some kind of control was necessary, but at present aircraft firms, amongst others, must apply to the Ministry of Munitions, Area Clearing House Board, for permission to buy any machines they require, the application forms being made in triplicate; if the Area Clearing House Board approve, the application is sent to the Central Clearing House Board; if the latter endorse the decision of the Area Clearing House Board it is sent to the Machine Tool Department for the necessary release number to be given. Cases are known where aircraft firms have had to wait one, two and three months before they could procure machines which have been lying in London warehouses.

Even when the necessary release number has been procured and the order placed, the suppliers must then fill up a form and send it to the Machine Tool Department for permission to execute the order. Is it any wonder that applications are lost, and manufacturers are compelled to patiently wait weeks and weeks before they can order? What guarantee have they that there will not be the same muddle and delay in obtaining approval to place orders for materials?

One interprets the regulations to mean that aircraft firms must submit all orders for any materials of construction whatever to the various directors to whom reference has been made. There are various reasons why one cannot guarantee the interpretation to be correct. For instance, manufactured details in Clause (b) cannot refer to the units in Clause (c), viz., tail planes, fuselages, etc.

Are manufacturers to understand that they refer to manufactured materials, such as switches, wood screws, copper tacks, varnishes, tanks, etc., etc? and, if so, why is the Controller of Aeronautical Supplies deputed to deal with dope and not varnishes? And is it intended that petrol, oil and gravity tanks are in the etc. of Clause (c), or the manufactured details of Clause (b)? And why not give a complete schedule of A.G.S. parts referred to in Clause (a), so that manufacturers would know if this includes such minor parts as split pins and thimbles?

Then again, seeing that R.A.F. wires and cables are on the A.G.S. sheets, and are shown separately in Clause (a), why not show everything in detail and make the schedule complete? One more example will suffice. Seeing that R.A.F. wires are shown separately, and swaged rods are not detailed, one presumes that the Controller does not wish contractors to submit orders for the latter for his approval, and if this assumption is correct, why should R.A.F. wires be included and swaged rods be excluded?

Aircraft firms have already had a little experience of Air Board control of materials.

Fabric.

In January Fabric became a controlled article. In The Aeroplane of March 7th, it was stated that all demands for Fabric must be sent to Capt. Stanley Clark, D.A.E., 4 S3, Room 506, Hotel Cecil. Perhaps some enlightened official will sooner or later inform manufacturers if fabric has been included in Clause (a) in error—firms not at present being allowed to negotiate direct with weavers—or if the original instructions are cancelled.

Now we proceed. One understands that the Fabric Controller considerably increased the number of weavers turning out aircraft Fabric, but did not, apparently, increase the number of bleachers, consequently the weavers turned out more Fabric than the bleachers could deal with, and stagnation resulted.

After six months the price was fixed (?) but, again, there appears to be a muddle. The weavers state emphatically that the prices are as follows:—

36 in wide	2s. 5½d.
38 in. wide	2s. 7d.
42 in. wide	2s. 10½d.
54 in. wide	3s. 8¼d.

On the other hand, the aircraft firms have been informed by the Air Board that the price will be 2s. 8d., 36 in. wide. There is no reason to doubt the information given, and this gives one a glaring example of control. A fair contention is that these blunders rile manufacturers of materials, and are not conducive to procuring maximum exertion from them. Furthermore, the abnormal advance in the price of 17C Fabric after the Air Board took control is very significant.

Timber.

Timber is another item of construction which has been controlled for a short time with disastrous results. Briefly summarised they are as follows:—

(1) Timber merchants never had such low stocks of Silver Spruce, Walnut and Mahogany, and the wood imported by the Government is reported to be very bad. The question of supplies has now become most critical.

(2) The prices have advanced more than 50 per cent., primarily due to an ever-increasing demand, and a corresponding decrease in shipments, due to inefficient control.

The various queries raised at the beginning of this report show conclusively the inefficiency of the staff deputed to control the materials for our most vital industry, and one can only hope that upon further consideration the Air Board will allow manufacturers to have a free hand in procuring materials. One is firmly convinced that suppliers are unanimous in their desire to deal direct with business men who have grown with the Aircraft Industry and have practical first-hand knowledge of their requirements.

Prices given below are for quantities on usual terms.

COPPER.—The situation in America is still very grave; some smelters are reported to be shut down, and the effect upon output is bound to be serious. As foreshadowed last week, there has been an all-round reduction of £5, and it would not be surprising to see a still further gradual decline:—

Copper Ingot (Standard)	£125 per ton cash.
Copper Sheets	£165 per ton cash.
Copper Tubes D.S.	20½d. per lb.
Brass Sheets 24 G.	16½d. per lb.
Brass Tubes S.D.	17d. per lb

TIN.—It is very significant that America is not calling for any Tin for forward delivery; notwithstanding this, there is still a fair demand here even with a high erratic market prevailing.

Last Month	£242 15s.
Last Year's Highest	£205 0s.

LEAD.—There has been no alteration in the official prices, and supplies are fairly good, although the position in Spain is still very unsatisfactory.

Official prices for Soft Foreign Pig, £30 10s. to £29 10s.

STEEL.—Supplies of Aircraft Steels do not appear to be making an abnormal increase, and prices still continue firm. The regulations for the Control of Steel given in last week's report are, as usual, liable to various interpretations, and any doubtful points should be taken up with the Controller of Aeronautical Supplies.

Current Average Prices.

R.A.F. 3B Steel Black or Blue Reeled, 36s. to 40s. per cwt. Basis.

R.A.F. 1E Steel Black or Blue Reeled, 78s. to 80s. per cwt. Basis.

R.A.F. 9A Sheet Steel, 30s. to 32s. per cwt.

ALUMINIUM.—The general position remains unaltered.

Ingot	£225 per ton
Re-melted	£210 per ton

TIMBER.—The shortage of supplies is becoming extremely

acute, and merchants are anxiously waiting to see what steps the Government intend taking to ensure that there will be adequate supplies of Aircraft Timbers available next Spring. One presumes they are not overlooking the fact that to enable the Factories to quadruple the output of Aeroplanes, it will be necessary to more than quadruple the shipments of Wood. The prices of Spruce continue very firm. Walnut is strong, and Mahogany shows a tendency to advance.

Current Average Prices.

Silver Spruce	17s. 6d. c.f.
English Ash	13s. 6d. to 15s. c.f.
Walnut	2s. 3d. to 2s. 6d. s.f.
Mahogany	2s. 2d. to 2s. 4d. s.f.

Prices are for selection and delivery.

FABRIC.—As stated in the first part of this report, there appears to have been a muddle made over the prices fixed for Fabric. The following official prices are quoted for the weavers, and we think they can be accepted as correct:—

17C LINEN FABRIC.

36 in. wide	2s. 5½d. per yard.
38 in. wide	2s. 7d. per yard.
42 in. wide	2s. 10½d. per yard.
54 in. wide	3s. 8½d. per yard.

Spaced Linen Fabric, 37½ in. wide, 1s. 7⅛d. per yard.

THE PATENTS INDEX.

The subjoined list of recent inventions has been specially compiled by THE AEROPLANE from the current Official Patents Records.

PATENT APPLICATIONS.

Bairstow, W. Wiring into and maintaining in position tail units, etc., of aircraft. No. 10285. July 17th.

Birault, C. Sighting instrument for aviation. No. 10414. July 19th.

Bruce, R. A. Fastenings of detachable or foldable aeroplane wings. No. 10420. July 19th.

Calthrop, E. R. Bomb-dropping devices. No. 10473. July 20th.

Calthrop, E. R. Destroying aerial craft. No. 10474. July 20th.

Dickinson, F. W. Aeroplanes. No. 10343. July 18th.

Motte, R. C. Screw propellers for aircraft, etc. No. 10347. July 18th.

Pashley, C. L. Flexible connections, control wires, etc., for aircraft, etc. No. 10412. July 19th.

Robson, J. Aeroplanes. No. 10508. July 21st.

Shortt, A. G. Method of operating automatic valves of balloons and airships by circumferential tension of the envelope. No. 10299. July 17th.

Sutton, G. W. Flying machines. No. 10288. July 17th.

Wells, R. F. Aeroplanes, etc. No. 10367. July 18th.

COMPLETE SPECIFICATIONS ACCEPTED.

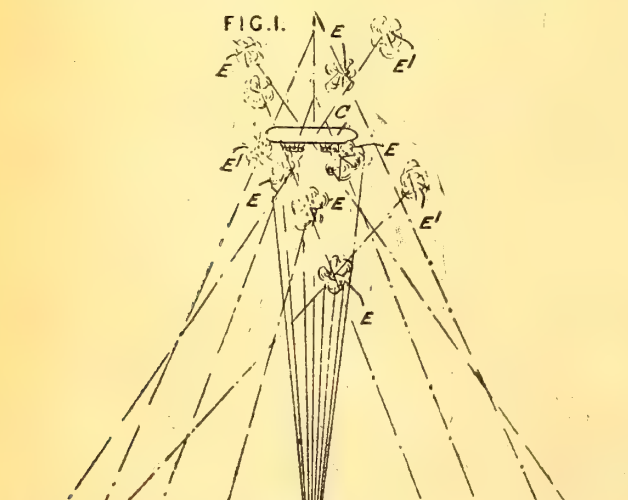
NONE.

ABRIDGMENTS OF RECENTLY PUBLISHED SPECIFICATIONS.

106,049. Aerial Warfare. STEINMETZ, J. A., 10, North Fourth Street, Philadelphia, Pennsylvania, U.S.A.

Consists in luring enemy aircraft over illuminated imitation buildings or other works on land or sea and then destroying them by gunfire. As shown, an imitation building A provided with a searchlight B is surrounded by guns D. The searchlight is arranged to illuminate the building when not used for spotting the enemy aircraft C. The guns are normally directed toward various points of the beam of light, and the projectiles are timed to explode at various points E within that field. The searchlight and the guns may, however, also be capable of having their directions changed; and the projectiles may be timed to explode at other points E^1.

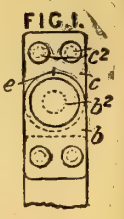
FIG. 1.



106,441. Aeronautics. CASTLE, J. P., c/o. Wellby, H., The Lea, Esher, Surrey.

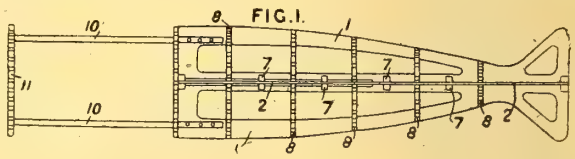
PLANES, ARRANGEMENT AND CONSTRUCTION OF.—To equalise the stress in duplicated tension wires on aeroplanes and other aircraft, the wires are connected to a member c pivotally mounted on another similar member or members b secured to the machine. The wires are connected through the usual turn-buckles to the pins c^2 disposed one each side of the joint b^2. Arrow-head indication marks e are provided on the members which, when in alignment, indicate that the stresses in the wires are equalised.

FIG. 1.



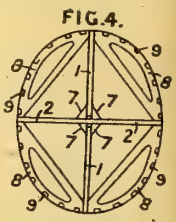
106,485. Aeronautics. VEDRINES, J., 33, Rue Notre-Dame de Lorette, Paris, and ASTOUX, L. L., 33, Avenue des Moulineaux, Issy, Seine, France. Convention date, May 16th, 1916. Not yet accepted. Abridged as open to inspection under Sect. 91 of the Act.

FIG. 1.



FRAMEWORK.—An aeroplane fuselage has a rear part built around two-ply wood frames crossed at a right-angle or other angle, and a front part formed of four longitudinal members braced together, bent, and secured to the vertical frame of the rear part. Fig. 1 shows two open frames 1 and 2 each slotted longitudinally to enable a crossed joint to be formed which is strengthened by brackets 7. Frames 8, Fig. 4, also of ply wood, and conforming to the outer shape of the fuselage, are secured to the frames 1, 2 and are notched at 9 to receive flexible longitudinal battens to support the fabric covering. The frames 2, 1 are integral with the fixed stabilising-plane and vertical fin respectively. The front part consists of four members 10 bent at their rear ends and secured to the frame 1. Ply wood frames 11 similar to the frames 8 are secured to the members 10. Fabric may be used between adjacent layers of wood in the various frames.

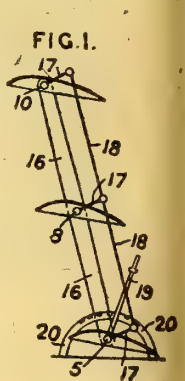
FIG. 4.



106,486. Aeronautics. VEDRINES, J., 33, Rue Notre-Dame de Lorette, Paris, and ASTOUX, L. L., 35, Avenue des Moulineaux, Issy, Seine, France. Convention date, May 1st, 1916. Not yet accepted. Abridged as open to inspection under Sect. 91 of the Act.

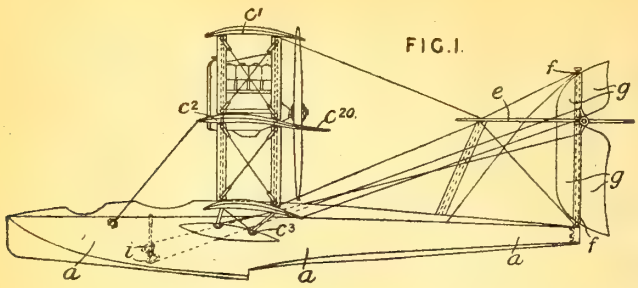
STEERING.—The planes of a multiplane are pivoted about their centres of pressure and are connected by a parallelogram linkage to enable their angles of incidence to be adjusted simultaneously. Fig. 1 shows a triplane in which the planes are carried by tubes 5, 8, 10 mounted in bearings on the fuselage and on bars supported by the fuselage. The outer ends of the tubes turn in bearings carried by members 16 braced to the fuselage. Each tube has a pair of arms 17, the three arms on each side being connected together by rods 18. The lowest tube 5 is turned by a lever 19 working over a quadrant 20.

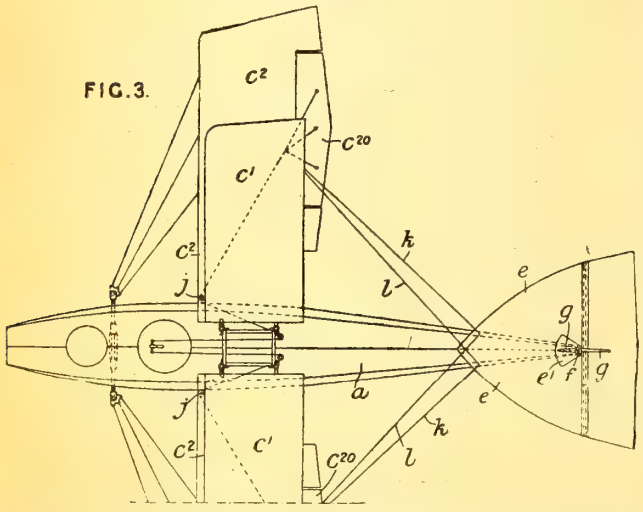
FIG. 1.



106,487. Aeronautics. BESSON, M. M. E., 23, Boulevard de la Saussage, Neuilly s/Seine, France. Convention date, May 3rd, 1916. Not yet accepted. Abridged as open to inspection under Sect. 91 of the Act.

AERIAL MACHINES WITHOUT AEROSTATS; PLANES, ARRANGEMENT OF; STEERING.—An aeroplane or hydro-aeroplane comprising several planes with different angles of incidence, has one of its supporting planes set at the same angle of incidence as the tail plane so as to have zero lift in normal flight but capable of assisting the machine when rising. Fig. 1 shows a triplane of which the planes diminish in incidence upwards, the top plane c^1 having the same incidence as the tail plane e. The centre plane c^2 is larger than the other two and has ailerons c^{20}. The plane e is at approximately the same level as the plane c^2 and is braced to the hull a, a rudder post f, and to the central struts of the planes. The empennage also is braced to the planes by





pairs of direct and crossed wires *k*, *l*, Fig. 3. The forward part of the rudder *g* works in a recess e^1 in the tail plane *e*. The wings fold as described in Specification 106,818 and the operating-wires for the ailerons are led over pulleys *j* beneath the plane c^2 which can accommodate themselves to changes in direction of the wires. The elevator is operated by wires connected to quadrants *i* on a hand-lever.

HYDROPLANE VESSELS.—The hull is shaped at the rear to act as a breakwater and the stem has surfaces at the sides to act as planes.

ANOTHER SPORTS MEETING.

On Saturday, July 21st, a sports meeting was organised by the Arrol-Johnston Cadet Corps in aid of local war funds, and was held in the recreation grounds of Dumfries Academy at Nunholm. Though primarily in the nature of an athletic gathering, the order of the day included also a spectacular feature in the form of a fancy dress and cycle parade through the town prior to the opening of the sports programme.

The sports meeting included a tug-of-war, flat and hurdle races, sack and three-legged races, boxing, tilting the bucket, and other tests of strength and skill, and both sexes competed with enthusiasm.

At the close of the sports, Mrs. Pullinger, wife of Mr. T. C. Pullinger, managing director of the Arrol-Johnston Works, presented the prizes to the winning competitors.

The prize list was as follows :—

100 Yards (Cadets, under 16).—1, Kerr; 2, M'Naught; 3, Smith.

100 Yards (Cadets, over 16).—1, Matthews; 2, Paton; 3, Bryden.

100 Yards (open).—Fulton.

220 Yards Hurdle Race.—1, Grant; 2, Kerr; 3, Smith.

Sack Race.—1, Heron; 2, Trotter; 3, Smith.

Odd Boot Race.—1, Raffel; 2, Thompson; 3, Bell.

Tilting the Bucket.—1, Marchbank and Trotter; 2, Halliday and Lawson.

Half-Mile.—1, Raffel; 2, Grant.

Tug-of-War (men).—Plant No. 1 beat Plant No. 2.

Tug-of-War (ladies).—Misses Halliday, Gordon, Steel, Kennedy, Whitelaw, Crampton, Lawson, Geddes.

100 Yards Girls' Handicap.—Miss Taylor.

Cycle Parade (men).—Mr. Holloway as "Harry Tate." Ladies —Miss Thomson as Indian Squaw.

Medals for Shooting Competition.—1, Piper Edgar; 2, Sergt. Wishart; 3, Second-Lieutenant Kirkpatrick; 4, Bugler Cruickshanks.

The whole function was an unqualified success, as was organised in a businesslike way, which reflects the high standard of the organisation at the Arrol-Johnston Works.

A WORKER'S VIEW.

BY AN AIRCRAFTSMAN.

It being universally admitted that our great need is for an increase in the number of aeroplanes at once, as a worker in the shops may I put before you reasons which, in my opinion, are keeping output low?

THE NEED FOR ORGANISATION.

Many preventable delays occur through men waiting for parts while assembling. The present way is to wait until workmen want the particular parts and then send to stores for them. If they are not in stores the workman must get on with something else, and the half-finished work hangs about in his way or he nurses his job till the said parts turn up.

Many hours are wasted thus, and the want of system gives the workshy his chance and disgusts the industrious worker. How long would this be tolerated in competitive work?

Surely the sensible way is to make out a complete list with the number of parts required when each order is received from the office, and have these ready before the job is given out to the workmen. No doubt a great number of these delays are due to the inexperience or laxity of foremen and charge-hands, who fail to realise that one of their chief duties is to look ahead and have the material to hand when wanted. I do not refer to experimental machines, but to those more or less standardised.

TIME CHARGES.

Again, the time taken over each job in some factories is not checked at all and in others very indifferently done. I submit that a voucher should be filled in for each job, and the workmen should be asked to sign this at the completion of his job. This would find out the efficient worker and also the loafer, who lives on his fellows' exertions, and would reveal astonishing differences in times taken on similar jobs.

As at present arranged in some shops, the times are filled in by charge-hands and the workmen do not know what work they are credited with. This causes a deal of mistrust and dissatisfaction.

WOMEN'S WORK.

To take the question of women's labour, where women are being introduced to assist in work usually done by men, I submit the best way is for one woman to be put to help a skilled man, who would be responsible for the job, and who would arrange for her to do the easier work and tell her the simplest way to go about it.

The experienced man naturally goes the easiest way to work, and this is, as a rule, the quickest. The novice will work twice as hard with less result. It is of no use to put women to try and produce the finished article as is sometimes tried, or to leave them to rub along at their own sweet will.

The methods in vogue now in some shops only produce indignation among the men at the waste of time and money, and causes vexation and loss of all interest in the work on the part of the women themselves. A deal of the work prepared by the women is done again by the man who values the appearance of his work when completed.

SHOP AGITATION.

Again, a lot of time is lost in discussing grievances. The shop agitator (often a charge-hand), whose chief aim is to advance his pet views and theories, seizes on any grievance to go the round of the shop and stir up trouble, and naturally the work suffers.

Say a lazy or incompetent man is dismissed. The men only get one side of the dispute. Indignation meetings are called in meal-times and the shop gets full of argument and discussions, and aeroplanes become a secondary consideration.

UNIONISM.

A newcomer into the shops is tackled as to his membership or not of a trade union. If not a member he is fed with argument till he joins to get peace. Once in the fold, he must do as he is told, down tools when bidden, and otherwise loses his independence.

The genuine worker sees money being wasted in the ways I have tried to explain and naturally thinks he may as well have some of it as wages. It must be remembered that the skilled men's wages in the aircraft works are not what they should be, and men are often obliged to draw on their pre-war savings to keep things going. Many are earning no more than before the war. The workers are a mixture from various trades, some highly paid, some lower, and the rate of wages started at the lowest.

If the management of these factories would arrange to receive suggestions direct from their employees, I think good results would follow. This is done in some works, I believe. Workmen do not care to make suggestions to foremen, etc., and lose any credit due to them if the suggestions are adopted.

A CHANGE OF NAME.

It should be noted that the Navarro Aircraft Co., Ltd., of Park Street, Burton-on-Trent, has been registered as the Burton Aircraft and Manufacturing Co., Ltd., and will in future be known as such. The company will carry on the same business upon the same premises, which will be extended in all departments.

(*Continued from page* 300).

Several tons of bombs were dropped with good results, numerous explosions being caused.

All machines and pilots returned safely.

THE CASUALTY LIST.

Reported July 25th.

ACCIDENTALLY DROWNED.—Morrison, Flt. Comdr. L. D., R.N.
Hervey, Lt. W. B., R.N.V.R.
SLIGHTLY WOUNDED.—Taylor, Flt. Sub-Lt. H. W., R.N.
SLIGHTLY INJURED.—Emmett, Prob. Flt. Officer C. W., R.N.

Reported July 26th.

ACCIDENTALLY KILLED.—Brett, Flt. Sub-Lt. L. H., R.N.
MISSING, BELIEVED KILLED.—Sharman, Actg. Flt. Comdr. J. E., D.S.C., R.N.
MISSING.—Page, Flt. Lt. J. A., R.N.
ACCIDENTALLY INJURED.—Bragg, Prob. Flt. Officer E. L., R.N.

Reported July 27th.

ACCIDENTALLY INJURED.—Vincent, Flt. Sub-Lt. F. J., R.N.
Nightingale, Flt. Sub-Lt. C. L., R.N.

Reported July 29th.

MISSING, BELIEVED KILLED.—May, Flt. Sub-Lt. T. C., R.N.
WOUNDED.—Staff Surgeon Edward L. Atkinson, R.N.
Campbell-Orde, Flt. Sub-Lt. A. S., R.N.
ACCIDENTALLY INJURED.—Wilson, Flt. Sub-Lt. W. C., R.N.
PREVIOUSLY REPORTED MISSING, NOW REPORTED MISSING AND BELIEVED KILLED.—Bray, Flt. Sub-Lt. F., R.N.
PREVIOUSLY REPORTED DIED AS PRISONER, NOW REPORTED ALIVE AND STILL A PRISONER.—Trechmann, Flt. Sub-Lt. B. A., R.N.

PERSONAL NOTICES.

DEATHS.

BEGG.—Flt. Sub-Lt. R. Gordon Begg, R.N., whose death was announced last week, was educated at Dorset House, Littlehampton, and Oundle School. He joined the Royal Naval Air Service in June, 1916, was selected for seaplane service, and after qualifying proceeded on active service in March, 1917.

BUSBY.—Flt. Sub-Lt. E. W. Busby, R.N., was shot down and killed in an air fight on July 10th. The second son of Mr. and Mrs. G. E. Busby, of Selly Hill, Birmingham, he was educated at King Edward's High School, Birmingham, and when war broke out he was serving his engineering apprenticeship with the Birmingham Small Arms Company.

He joined the R.N.A.S. in June, 1916, went abroad last April, and was responsible for bringing down one kite balloon and four enemy machines, driving down two others, and assisting in destroying another two. His Flight Commander writes:—"He is a serious loss to the squadron and a personal loss to us all."

MORRISON, HERVEY, and WARD.—Verdicts of "Accidental death" were returned at inquests held on July 24th on the bodies of Flt. Comdr. Louis Duncan Morrison, R.N., aged 31, Lieut. William Baker Hervey, R.N.V.R., aged 33, and Second Class Air Mechanic Henry Richard Ward, R.N., aged 19, who were drowned on the East Coast on July 21st.

ENGAGEMENT.

SHOPPEE—TAIT.—The engagement is announced of Flt. Lt. L. Conrad Shoppee, D.S.C., R.N., son of Eustace Cyril Shoppee, Esq., of Cape Town, South Africa, and Hilda, only daughter of the late Captain Thomas A. Tait, R.N.R., and niece of the Rev. R. Gifford-Wood, M.A., B.D., Vicar of East Cowton, Northallerton, Yorkshire.

BIRTH.

LAYARD.—On July 29th, at "Tarmon," Aldrington Road, Streatham Park, Molly, the wife of Lt. A. Raymond Layard, R.N.V.R., attached R.N.A.S., of a son.

MILITARY.

G.H.Q. COMMUNIQUÉS.

JULY 24th, 9.0 p.m.—Great activity on the part of our aeroplanes continued yesterday, and much successful work was again accomplished in co-operation with our artillery. Over four tons of bombs were dropped by our raiding squadrons on the enemy's aerodromes, ammunition depots, and railway junctions.

Fewer German aeroplanes were encountered, and fighting was not so severe. Three hostile machines were brought down, and three others were driven down out of control.

None of our machines are missing.

JULY 25th, 9.10 p.m.—Yesterday, thick haze interfered greatly with operations in the air. Bombing raids were none the less carried out by our aeroplanes during the day as well as during the previous night.

Fighting took place in the evening, and four German machines were driven down out of control.

Three of our machines are missing.

JULY 26th, 8.35 p.m.—Owing to thick mist, there was little activity in the air yesterday. One German machine was brought down in air fighting.

One of our machines is missing.

JULY 27th, 8.50 p.m.—Little flying was possible yesterday until the evening, when sharp fighting took place for about two hours. One hostile machine was brought down, and one other driven down out of control.

Two of our machines are missing.

JULY 28th, 9.50 p.m.—Yesterday morning aerial activity was slight, but from 1 p.m. till dark it became very great. The fighting was intense, and the day proved a markedly successful one for our aviators.

The vigorous offensive tactics employed enabled our artillery machines to carry on their work successfully during the day, and made it possible for us to take an unusually large number of photographs.

Our bombing squadrons, moreover, carried out many raids and bombed four of the enemy's aerodromes. Some of our machines came down to very low altitudes at a distance of over 40 miles behind the enemy's lines.

Fifteen German machines were crashed to the ground, and 16 others driven down out of control.

Three of our machines are missing.

JULY 29th, 9.39 p.m.—Yesterday, there was again great activity in the air, and fighting was continuous.

On the night of the 27th-28th inst., important railway stations and two hostile aerodromes were bombed by our aeroplanes, and during the day a number of other bombing raids, as well as much photographic and artillery work, were carried out by us with success.

In air fighting 16 German machines were brought down and 14 others were driven down out of control. In addition, two hostile observation balloons were brought down in flames.

Thirteen of our machines are missing.

JULY 30th, 8.52 p.m.—On the night of the 28th-29th inst. bombs were dropped by our aeroplanes on a German aerodrome, two important railway stations, and an ammunition depot, where fires and explosions were caused.

Bombing operations were continued yesterday, and there was great activity in the air until 10 a.m., when a severe and sudden thunderstorm prevented further flying. Many of our aeroplanes were caught in the storm, and four have not returned.

In air fighting four German aeroplanes were brought down and two others were driven down out of control.

Six of our machines are missing, including those lost in the storm.

WAR OFFICE COMMUNIQUÉ.

JULY 26th.—The G.O.C. British Forces in Macedonia reports:

Except for the successful raid on Homondos, which has already been reported, activity during the past week has been confined to aerial enterprises. Our machines have bombed Porna station, camps near Seres and Demirhissar, the depot at Petric, and Dedli (north-west of Lake Dorian).

HOME COMMAND COMMUNIQUÉS.

JULY 27th.—The latest reports show the following revised list of the casualties which resulted from the air raid of July 7th:—

KILLED.

Men.	Women.	Children.		Total.
42	9	8	=	59

INJURED.

Men.	Women.	Children.		Total.
98	45	50	=	193

These figures include all casualties of every nature.

[Since the issue of the last communiqué on the subject of the air raid of July 22nd, two more deaths are reported to have taken place.

The total number of casualties is now:—13 killed and 26 injured.]

THE CASUALTY LIST.

Reported July 23rd.

KILLED.—Johnstone, Capt. M., R.F.C.
WOUNDED.—Rouquette, Sec. Lt. D. G., A.S.C., attd. R.F.C.
MISSING.—Coombs, Sec. Lt. V. C., R.F.C.
Davis, Sec. Lt. G., R.F.A. and R.F.C.
Parkes, Sec. Lt. G. A. H., R.F.C.
CORRECTIONS.—Hurley, Sec. Lt. A. V., R.F.A. (reported wounded), should read:—Hurley, Sec. Lieut. A. V., R.F.C.
Cruikshank, Sec. Lt. K. G., R.F.C. (reported missing), should read:—Cruickshank, Sec. Lt. K. G., R.F.C.
KILLED.—R.F.C.—Jessop, 25501 1st Cl. Air Mech. J. O. (Forest Hill, S.E.).
McMahon, 43271 2nd Cl. Air Mech. S. (East Ham, E.).
AUSTRALIAN FORCE.—MISSING, BELIEVED KILLED.—Searle, Sec. Lt. A. H., Flying Corps.

Reported July 26th.

KILLED.—Brufton, Sec. Lt. H. C., Rif. Brig. and R.F.C.
Palmer, Sec. Lt. P. E., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Adams, Sec. Lt. F., R.F.C.
Carey, Sec. Lt. A. S., R.F.C.
Kelly, Sec. Lt. O. R., North'd. Fus., attd. R.F.C.
Thompson, Lt. J., R.F.C.

WOUNDED.—Davies, Sec. Lt. R. S., R.F.C.
Hartridge, Lt. F. W., R.F.C.

MISSING, BELIEVED KILLED.—Paget, Lt. G. L., North'd Fus., attd. R.F.C.

MISSING.—Felton, Sec. Lt. C. T., R.F.C.
Hay, Lt. R. B., M.C., W. Yorks. R., attd. R.F.C.
Partington, Lt. O. J., R.F.C.
Thompson, Sec. Lt. W. G., Suff. R. and R.F.C.
Workman, Lt. C. S., M.C., Sco. Rif., attd. R.F.C

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Barrie, Sec. Lt. F., R.F.C.
de Selincourt, Capt. A., R.F.C.
Lister, Sec. Lt. B. S., R.F.C.
Moody, Sec. Lt. B. C., Lond. R. and R.F.C.
Robertson, Sec. Lt. G. M., High. L.I., and R.F.C.

ACCIDENTALLY KILLED.—R.F.C.—Fenton, 69421 Sec. Cl. Air Mech. A. (Musselburgh).

Reported July 27th.

WOUNDED.—Barney, Sec. Lt. L. W., R.F.C.

Reported July 28th.

WOUNDED.—Noss, Sec. Lt. A. R. H., R.F.C.

CANADIAN CONTINGENT.—DIED OF WOUNDS.—Porter, Lt. H. E. M., Cent. Ont. R., attd. R.F.C.

WOUNDED.—McIntosh, Lt. P. D., Queb. R., attd. R.F.C.

MISSING.—Weld, Lt. D. S., W. Ontario R., attd. R.F.C.

CORRECTION.—Cotton, Lt. H. H., Inf., attd. R.F.C., previously reported missing, now reported prisoner in German hands, should read:—Cotton, Lt. H., Quebec R., attd. R.F.C.

Reported July 29th.

WOUNDED.—Lowcock, Capt. R. J., M.C., Sher. For., attd. R.F.C.
Madge, Lt. J. B. C., R.F.C.

MISSING.—Grosset, Lt. W. E., High. Cyclist Bn., attd. R.F.C.
Jardine, Sec. Lt. R. G., R.F.C.
Shepherd, Sec. Lt. A. S., D.S.O., M.C., R.F.C.

KILLED.—R.F.C.—Duncan, 53358 2nd Cl. Air Mech. T. (Craigie); Whatley, 2056 Sgt. H. A. (Pewsey).

DIED OF WOUNDS.—Lancers, attd. R.F.C.—Russell, 6564 L.-Cpl. F. (Long Melford).

PERSONAL NOTICES.

DEATHS.

BASSFORD.—An inquest was held at Dover on July 30th on the body of 2nd Air Mech. T. J. Bassford, who was killed by the propeller of a machine which crashed into a tent. The inquest was adjourned.

BERWICK.—Sec. Lt. Robert G. Berwick, R.F.C., who was killed in a flying accident at Scampton, Lincolnshire, on July 6th, was the younger son of Mr. and Mrs. W. J. Berwick, of Schubert Road, East Putney. Mr. Berwick was 20 years of age. He joined the Inns of Court Officers' Training Corps in 1915, serving with that unit until his transfer in February, 1917. His brother officers spoke of him as a brave and fearless pilot, and his loss is deeply mourned in his squadron and by all who knew him.

BURT.—Lt. Owen Lyndon Burt, R.F.C., who was killed in action on July 23rd, was the son of Mr. and Mrs. Owen Burt, of 37 York Terrace, Regent's Park. He was 21 years old.

CLIFTON.—Lt. George Leake Cecil Clifton, R.F.C. (died of wounds), was third son of Mr. R. Cecil Clifton, Under Secretary for Lands, Western Australia. Mr. Clifton came from Perth, Western Australia, and saw service in Egypt and Gallipoli. He became a signaller, and was amongst the last to leave the Peninsula on the evacuation. He was on the Western Front until November, 1916, when he was sent to an Officers' Training Battalion, and secured a commission in the Royal Flying Corps. Only recently he won his wings, and he was considered a most promising pilot; he was exceedingly popular among his brother officers and men.

D'ERF-WHEELER.—Captain Percival Francis Crommelin d'Erf-Wheeler, Dorset Regt., attd. R.F.C., who was killed on duty on July 24th, was the eldest son of Grace and Percy d'Erf-Wheeler and grandson of the late Dr. Blyth, Bishop in Jerusalem. He was 23 years of age.

DUERDEN.—Sec. Lt. H. Duerden, R.F.C., was landing in a field in Lincolnshire on July 28th, when his aeroplane struck a tree and turned over. He was picked up unconscious and died shortly after in a hospital.

HART-DAVIES.—Lt. Ivan Beauclerk Hart-Davies, R.F.C., who died on July 27th, as the result of an aeroplane accident in England, was the son of the late the Rev. John Hart-Davies and Mrs. Hart-Davies, of Southam Rectory, Warwickshire. He was 39 years of age.

Mr. Hart-Davies' death will be very deeply felt by a large number of friends in the Midlands, where he was well known as a pioneer of motoring. He was a sportsman of the finest type, an all-round athlete, and personally immensely popular.

He learned to fly for sport before the war, and, despite his being considerably over what is officially considered to be the proper age for flying, he became a very good pilot. He joined the R.F.C. not long after the outbreak of war, giving up a profitable occupation to do so, and saw considerable service, chiefly as a pilot of fighting machines.

He was lately appointed to a new fighting squadron, and was looking forward keenly to the prospect to meeting the enemy with the odds more in his favour than had hitherto been the case. In him the R.F.C. has lost a popular and gallant officer, and many of us have lost a highly valued friend.—C. G. G.

HUGGAN.—Sec. Lieut. Thomas Huggan, R.F.C., aged 19, was killed while flying on the South Coast on July 24th. His machine side-slipped and nose-dived from an altitude of 50 ft., and caught fire. The aviator's body was found among the wreckage.

Sec. Lt. Thomas Huggan, R.F.C., was in the nineteenth year of his age, and was the younger son of Mr. Joseph Huggan, of Pudsey. He had his commission in September, 1916.

He was educated at Marlborough College, where he was head of his house (Littlefield), a member of the school hockey eleven. He entered the R.F.C. in September, 1916, on his 18th birthday. From December, 1916, to last July he was in France as an observer, and he had just begun his pilot's course in England when he met his death.

HUGHES.—Sec. Lt. E. P. Hughes, R.F.C., who has died as the result of a flying accident on June 9th, was the eldest son of Mr. E. J. Hughes, of Ellesmere, Knapdaar, near Burghersdorp, Cape Colony, and a nephew of Colonel Hughes, of the Defence Department, Pretoria. He came to England with the South African Contingent in 1915, was transferred to the R.F.C. in August, 1916, and obtained his pilot's certificate early in the present year. The injuries he received on June 9th were very serious, and he died in a military hospital on July 27th. Before his accident he had been for some time engaged on munitions work with certain inventions of his own.

KILGOUR.—The Dover coroner held an inquest on July 30th on the body of Lt. Arthur R. Kilgour, R.F.C., who was killed while doing a tail slide. According to a witness who had previously completed a 40-minutes' acrobatic flight in the machine, it must have become uncontrollable, and, coming down in a steep spiral, crashed to the ground. Lt. William Williams, who was in the machine as pupil, was seriously injured. A verdict of "Accidental death" was returned.

MACFARLANE.—Sec. Lt. Harold Embleton Macfarlane, R.F.C., who was killed on July 14th, aged 18, was the eldest son of Mr. and Mrs. Harold Macfarlane, of Northwood, Middlesex. Born at Harrow in 1898, he received his early education at Mr. Douglas Gould's Preparatory School, The Briary, Westgate-on-Sea. From The Briary he proceeded, in September, 1911, to Westminster School, where he remained five years. He played for his house (Home Boarders) at cricket, football, and fives, and took part in the drill competition of the O.T.C. On leaving school at the end of the summer term of 1916, when he received his 3rd eleven colours, he joined the Army, and received his commission in February and his "wings" in May. He went to the front in June.

A schoolfellow who was with him three years wrote:—"Everyone was fond of 'Peter.' He always had such a jolly way with him. I never saw him down in the dumps or out of temper once the whole time we were together. . . . 'Mac' would always do anything that was dashing. To have seen him charge up and down the football field, not caring a hang for his shins, his one idea being to put the ball into the goal, is enough to tell you of what good stuff he was made."

MIDDLETON.—Lieut. J. R. Middleton, R.F.C., who was wounded and taken prisoner on March 24th, and was kept in hospital at Mulheim Ruhr, Germany, till he died there on June 21st.—Mrs. Middleton, 38, Inverleith Place, Edinburgh, will be very grateful to any person who will send her the name and home address of any prisoner who was in the hospital during that period and may be able to give information about her son during his illness.

NORRIS.—Sec. Lt. Harold Aubrey Blurton Norris, R.F.C., who was killed on July 24th, was the only son of Harold and Flo Norris, Windydene, Dartford Heath, Kent.

PHILLIPS.—In a town in the Eastern Counties on July 24th an inquest was held concerning the death of Lt. Joseph Lee Phillips, R.F.C., a Canadian, aged 23. He had been learning to fly for over a month, and started on a solo flight, but did not return. Afterwards he was found in a cornfield, his aeroplane having apparently turned over twice. A verdict of accidental death was returned.

ROBERTSON.—Sec. Lt. Archibald Gordon Robertson, Black Watch, attd. R.F.C. (previously reported missing, now reported

killed in action near Roulers on June 8th), was second son of Mr. Duncan Robertson, of Crantit, Orkney. He was 19 years of age, and had his commission in the Black Watch in August, 1916.

THOMAS.—Capt. R. N. Thomas, R.F.C., who was killed in action on July 23rd, while serving with the Egyptian Expeditionary Force, had previously served 11 months in France, and was recently awarded the Croix de Guerre. He left England only a few weeks ago. He was the eldest surviving son of Brig. Gen. Sir Owen and Lady Thomas, Cemaes, Anglesey, and was one of three brothers who served under their father in the Welsh Army in 1914-15. He transferred to the R.F.C. in 1915. In the South African War he served as a trumpeter in the Prince of Wales's Light Horse, a regiment which was raised and commanded by his father. His youngest brother, Lt. Trevor Thomas, R.W.F., was killed in action in January, 1916, and his only surviving brother is a Captain in the R.F.C.

THOMAS.—Lt. Maurice Wotton Thomas, R.F.A. and R.F.C., reported missing on August 5th, now officially presumed killed on that date, aged 21, was the younger son of Mr. and Mrs. Alick Thomas, of Worcester Park, Surrey. He was educated at Parkside, Ewell, and in September, 1907, passed into Osborne College, where, as the result of an epidemic, he contracted an illness, which necessitated his being invalided, as unfit, from the Royal Navy in 1910. After 18 months of convalescence he was allowed to continue his education with Mr. Sellar, of St. Andrew's, and Mr. Tinniswood, of Camberley, whence he passed into Woolwich in 1912, and, passing out in September, 1914, received his commission in the R.F.A.

In May, 1915, he went to the front as A.D.C. to a general commanding an R.A. division, and was promoted lieutenant in July, when it was decided that he was specially qualified by his training for the R.F.C., to which he was seconded as observer. After many experiences he had an accident in December, 1915, and came home. He made a speedy recovery, and was sent to a reserve squadron and gained his wings. In May, 1916, he was again sent out, doing much valuable work over the enemy positions.

He was a fine revolver shot, and a member of the shooting eight when at Woolwich. His Squadron Commander and brother officers all bear testimony to his fearlessness, keenness, and efficiency both as observer and pilot. His elder brother, Capt. Alec Vaughan Thomas, E. Surrey Regt., attached 2nd Hampshire Regt., was killed in Gallipoli, August 6th, 1915, aged 22.

TOPHAM.—Sec. Lt. Michael Topham, R.F.C., whose death was announced last week, was born in India in 1895, he came to England at an early age and was educated first at Yardley Court School (Mr. A. L. Bickmore), Tonbridge, afterwards proceeding with a foundation scholarship to Tonbridge School, where he became head of Manor House. At school he specially distinguished himself as a member and for two years the captain of the O.T.C. shooting eight.

He left school in 1914 after gaining an open scholarship at Downing College, Cambridge, and a Judd scholarship from the school; but on the outbreak of war he enlisted in the U.P.S. Battalion of the Royal Fusiliers, obtaining the rank of sergeant. In the following year he went with his regiment to France and served through the winter of 1915-16. In 1916 the regiment returned to England and he entered a cadet battalion and, passing out first, volunteered for the Royal Flying Corps. He obtained his wings early this year, and was soon afterwards sent to the front as a flying officer.

Within a month of his returning from a successful bombing raid with his squadron he was reported missing. Information through a reliable channel has now been received that he was shot down and instantly killed. His C.O. wrote that he was an excellent pilot, very keen, a great acquisition to the squadron, and considered capable of great things.

TURNER.—Lt. Warren Geoffry Dalton Turner, R.F.C. (previously reported missing, now reported killed in action over the German lines on May 24th), was second son of Mr. and Mrs. A. Turner, late of Clifton Lodge, East Heath Road, Hampstead. He was 21 years of age, and had his commission in the New Armies in the early months of the war. Transferring to the R.F.C. he had his "wings" in July of last year, and his Army rank of lieutenant was gazetted in October.

WILLIAMS.—Sec. Lt. Vaughan Floyer Williams, R.F.C., who was reported missing on April 2nd, 1917, and now known to have been killed in an air fight on that day, was 18 years of age, and was the youngest son of Mr. and Mrs. Glynne Williams, of 7, Berkeley House, Hay Hill, W.

ENGAGEMENTS.

MACLEAN—LEWIN.—A marriage has been arranged between Capt. (temp. Major) C. T. Maclean, M.C., Royal Scots Fusiliers, attd. R.F.C., and Maria Dorothy (Birdie) Lewin, only child of Mrs. Lewin, Kirklevington Hall, Yarm.

SEELY—NICHOLSON.—A marriage has been arranged, and will shortly take place, between Brigadier-General the Right Hon. J. E. B. Seely, C.B., D.S.O., M.P., of Brooke House, Isle of Wight, and the Hon. Mrs. George Nicholson, widow of Captain George C. N. Nicholson, R.F.C., and youngest daughter of Viscount Elibank.

It will be remembered that the late Captain Nicholson was General Seely's private secretary. Captain Nicholson later endeavoured to assist in improving the quality of the machines supplied to the R.F.C., and was eventually killed in an accident on an inferior machine.

MARRIAGES.

BEST—SMITH.—At St. Mary's Parish Church, Wimbledon, on July 28th, Sec. Lt. Robert Dudley Best, R.F.C., elder son of Mr. Robert H. Best, Birmingham, was married to Beryl Gladys, younger daughter of the late Robert Smith and of Mrs. Robert Smith, Ardmore, Marryat Road, Wimbledon Common, S.W., by the Rev. Arthur Bridge, late Rector of Worth, Sussex, assisted by the Rev. E. J. Becknell, Principal of the Clergy House, Wimbledon.

PAYNE—CRAVEN.—On July 26th, at St. Martin's-in-the-Fields, Trafalgar Square, Albert Wyndham, Lt., R.F.C., fourth son of the late Mr. W. H. Payne and of Mrs. Payne, "Rosendale," Caversham, Reading, was married to Dorothy Constance, youngest daughter of Mr. and Mrs. Arthur Craven, Hallas Hall, Cullingworth, Yorks, by the Rev. Herbert Pegg.

BIRTHS.

DUFF.—On July 26th, at Fritton, St. Alban's Crescent, Bournemouth, the wife of Capt. Ian Duff, R.F.C., of a son (still-born).

MANN.—On July 24th, at 22, Charlbury Road, Oxford, Marie (*née* Berthon), the wife of Capt. A. J. Mann, R.F.C., of a daughter.

Sec. Lt. Kenneth B. Cooksey, Royal West Kent Regt., attd. R.F.C., has been missing since April 8th. His mother, Mrs. Cooksey, of Springwell House, Old Hill, Staffordshire, would be grateful for any news.

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Sec. Lieut. H. Berners Begg, who has been missing since November 24th, 1916, came home from India to join the Royal Flying Corps. He took his "wings" in the September of that year.

FRANCE.

OFFICIAL COMMUNIQUÉS.

JULY 24th.—Last night enemy aeroplanes dropped several bombs on the town of Nancy and on the region south of that town. There were no casualties.

ARMY OF THE ORIENT.—The Allied aviators bombarded successfully enemy encampments in the region of Demirhissar (Struma front) and Staravina.

JULY 28th.—ARMY OF THE ORIENT.—British aviators bombarded the enemy's encampments in the region of Rupel. There have been artillery activity in the Majadag region and patrol encounters on the Serbian front.

* * *

It is reported that at a quarter to five on July 25th a German aeroplane flew over a French ambulance on the Vaux-Varennes front, to the north of Jonchery-sur-Vesle. It is said that the aviator descended to a very low altitude, so that he was clearly able to distinguish the red crosses painted on the roof, and then dropped four bombs, which all hit their mark, which was deliberately chosen. A doctor, a chemist, and a nurse were killed on the spot, a second doctor succumbed to his injuries shortly afterwards, and a third doctor and an administrative official were seriously injured.

* * *

Late on the night of July 27th and early on the morning of July 29th alarms were given in Paris of a German air raid. The sky was brilliantly clear, and on both occasions a large number of French aeroplanes could be seen flying at a great height. In neither case did the raid cause any damage.

A semi-official note issued in Paris on July 29th says:

The German official communiqué of July 28th asserted that German aviators bombed railway stations and military establishments in Paris during the course of the preceding night, and that certain of the projectiles hit their marks. This assertion is untrue. The attempted attack by enemy aeroplanes to the south of Paris caused no loss of life or material damage.

GERMANY.

OFFICIAL COMMUNIQUÉS.

JULY 28th.—During the course of numerous engagements the enemy lost 13 aeroplanes.

Last night bombs were dropped upon the railway stations and military establishments of Paris. Hits on the objects aimed at

were observed. Our aviators returned unharmed in spite of the strong defensive fire.

July 29th.—Aerial activity was extraordinarily lively, especially on the Flanders front. Thirty-five enemy aviators were shot down. Ober-Lieut. Dostler, at the head of a pursuing squadron, destroyed a squadron of six enemy aeroplanes, and himself gained his 20th aerial victory. Ober-Lieut. Ritter von Tutschek shot down his 19th and 20th aerial opponents in battle.

July 30th.—The enemy lost 10 aeroplanes in aerial battles. Ober-Lieut. Ritter von Tutschek brought down his 21st opponent.

RUSSIA.

Official Communiqué.

July 29th.—Between the Baltic and the River Pripet there was aerial activity.

July 30th.—In the Baltic Sea on Friday an enemy Zeppelin while flying over the Aland Islands dropped 20 large bombs on the town of Tornby, near Mariehamn. The Zeppelin was fired at by the guns of the Fleet, as well as by the shore batteries.

In the Gulf of Riga squadrons of enemy seaplanes carried out raids in the neighbourhood of the Island of Tserel and Arensburg. Fired at by the Fleet and the shore batteries the machine disappeared, after dropping about 20 bombs without effect.

A squadron of enemy aeroplanes in the same district attacked one of our destroyers, dropping eight bombs without effect.

ITALY.

Official Communiqués.

July 25th.—Two of our bombing flights, accompanied by chasing aeroplanes, carried out a raid on hutments and railway works at San Daniele, on the Carso. All our machines returned to their bases.

July 26th.—Last night one of our airships paid a surprise visit to S. Lucia (Tolmino) (Upper Isonzo), and dropped a ton of high explosives on the railway works, doing considerable damage.

July 28th.—The air services were active along the whole front. On the evening of the 27th one of our airships effectively bombed the railway between S. Lucia (Tolmino) and Bazza di Modrea (Upper Isonzo), and the Opcina (north of Trieste) military works were damaged by our aeroplanes.

This morning a large flight with an escort of chasers dropped nearly three tons of high explosives on the electric power station at Idria and on hutments in Chiapovano Valley (north-east of Gorizia).

July 29th.—Yesterday evening one of our large bombardment air squadrons, escorted by chasers again raided the military establishments at Idria and the hutments in the Chiapovano Valley, and, notwithstanding heavy fire from the enemy's anti-aircraft guns, dropped four tons of high explosives.

On the return journey the chasers brilliantly engaged a large number of enemy machines which had risen, and, after having brought down two, returned safely to their base, which the battleplanes had already succeeded in reaching.

July 30th.—On the Julian front air activity was considerable; an enemy machine was brought down by one of our aviators east of Tolmino (Upper Isonzo).

* * *

As a reprisal for an attack on Grado by Austrian seaplanes, Italian seaplanes on July 28th dropped bombs on the enemy's hangars at Prosecco. The same day the enemy delivered an air attack on Termuli, injuring four persons, and on July 28th the Austrians repeated their attack on Grado.

* * *

An American aeronautical mission has been on a visit to this country to get an insight into what constitutes the present-day "complete as fitted."

Col. Mitchell, Major Bolling, Commander Westervelt, Capt. Clark, and Lieut. Child are reported as being among the officers attached to the mission, while Mr. Marmann and Mr. Hughes are, presumably, civilians of the party. Samples of all the various machines now in use at the home aerodrome were exhibited to them at Mirafiori a few days ago, and some smart airmanship was visible to him who had eyes to see it.

Mention of this flying ground reminds me that so far I have not for a good enough reason made any mention of the A.E.R. firm of Turin in these notes. The company builds Caudrons, and, to all accounts, does this to everyone's great satisfaction. Mention of the name in connection with height records and school machines is about all one can report as yet.

A sympathetic eulogy of British Blimps as supplied to this country is published by a contemporary.—T. S. Harvey.

BELGIUM.

Official Communiqué.

July 29th.—Our aviators, whenever the weather was favourable, have displayed very great activity. Three enemy aeroplanes were brought down, one of them falling a few yards from our advanced trenches.

SERBIA.

Official Communiqué.

July 23rd.—Our aviators brought down an enemy aeroplane, which fell in our lines near Kapignani (Moglena sector). They also dropped 32 bombs on Kravica and Gradesnitza (west of the Moglena).

HOLLAND.

"Het Volk" (Amsterdam, July 30th), reports that a German aeroplane landed during the previous day near Oostburg (north-east of Bruges) owing to a damaged propeller. The pilot, a naval aviator, has been interned.

U.S.A.

A message from New York on July 26th states that Mr. Symond Saxe has offered a prize of one thousand dollars to the first American who drops bombs on Berlin. This offer is made in memory of the relatives he lost in the sinking of the "Lusitania."

* * *

It was reported from New York on July 24th that the Industrial Workers of the World have closed down all the spruce mills of Wisconsin and Minnesota. It is believed that this has been brought about by German money. The Government is expected to take a strong action, as spruce is essential for the building of aeroplanes.

* * *

Mr. Quentin Roosevelt, the ex-President's youngest son, is a member of the contingent of American aviators who are coming to Europe.

THE CURTISS CORRUPTION CHARGE.

At Bow Street, on July 25th, William August Casson (64), a retired Civil Servant, living at Bedford Road, Chiswick, was charged on a warrant, before Sir John Dickinson, for "unlawfully and corruptly conspiring with Wing Commander John C. Porte, R.N., and Lyman J. Seely to contravene the provision of the Prevention of Corruption Act, 1906, in respect of large sums of money from time to time corruptly paid to and received by John C. Porte, an agent of the Crown, in respect of certain contracts between the Lords Commissioners of the Admiralty and the Curtiss Aeroplane Company, of New York."

Sir Charles Mathews, director of Public Prosecutions, occupied a seat on the Bench.

Sir Archibald Bodkin, who appeared on behalf of the Public Prosecutor, said that, so far as the case was concerned, he would suggest that he should on the present occasion only prove the arrest of the defendant. He would then ask for a remand, and would open the case on a future occasion. The case was adjourned until August 3rd.

The magistrate said he was prepared to accept bail of £1,000 or two sureties of £500 each. Mr. F. A. Rudall, solicitor, of 48, Watling Street, E.C., and Mr. Bernard Barnes, of Stanthrop Road, Streatham, came forward and were accepted, both gentlemen stating that they were not acting professionally.

* * *

On March 30th **Mr. Billing** asked whether any officer or official at present concerned with the construction or origination of aeroplanes, or who has planned designs for the Royal Naval Air Service, has ever produced a successful flying machine of the heavier-than-air type; whether any such machines have been used on active service; whether several officers who have produced successful designs before the war and joined the Royal Naval Air Service on or about the outbreak of the war have left the Service and entered the employment of private firms; and whether the residue have been proved to possess sufficient ability to justify their being entrusted with the approval, alteration, or condemnation of designs produced by private constructors of proved experience?

Dr. Macnamara: The answer to the first two parts of the question is in the affirmative. As regards the third part, officers have been allowed to resign their commissions in order to enter the employment of private firms where it has been clear that their experience and technical knowledge would be of advantage in the production of machines, and, therefore, in the public interest. As regards the last part of the question, the hon. gentleman is, of course, aware that the general question of the design of aircraft is now a matter which is dealt with by the Air Board. That being so, it does not appear to me that any useful purpose would be served by discussing by way of question and answer the abilities of the technical officers of the Royal Naval Air Department.

Mr. Billing: Can the right hon. gentleman give me the name of any type, or the name of any given machine, which these officers have designed which has been successful?

Dr. Macnamara: The hon. gentleman must put that question on the Paper.

On April 2nd **Mr. Billing** asked the First Lord of the Admiralty the names of the officers of the R.N.A.S. who had designed the aeroplane or seaplane which had been successfully employed against the enemy?

Dr. Macnamara: Wing-Commander Porte, R.N.

[It will be noted that Commander Porte was the only officer of the R.N.A.S. credited officially with having produced a successful aeroplane.—C. G. G.]

In the Hands of the Enemy.

The following list of 148 British aeroplanes which fell into the hands of the Germans during April, 1917, has been published in the German Press :—

[Many of the names appear to have been mangled in transcription.—Ed.]

35 B.Es.

B.B.7061.—Names of passengers not given.
A.2815.—Davidson, killed.
A.2140.—First Lieut. Henry, Lieut. Logan.
A.2141.—Lieut. White, B. W.; Lieut. Evans, Bernhard; both killed.
A.3330.—The observer severely wounded; the pilot killed.
5849.—Lieut. F. L. Kitchen, 4th Squadron, killed.
2769.—F. Mathews, slightly wounded.
?.—W. Y. Chalk.
A.78.—Sec. Lieut. Davies; Sec. Lieut. Samuel; both taken prisoners.
2562.—Lieut. Comb; one passenger killed, the other severely wounded.
2553.—Sergeant John Field Danger (Dangerfield?); Mechanic E. D. Harvey, taken prisoners.
3213.—Lieut. E. G. Dilmitt; Sergeant S. Smith Fieldhouse; both taken prisoners.
19683.—Passengers burnt to death.
N.R.1268.—Passengers killed.
Austin motor 2203.—Lieut. Granes, burnt to death.
5870.—The pilot severely wounded; the observer unwounded; both taken prisoners.
Motor 7177.—Lieut. Radcliffe, killed.
2713.—Both passengers burnt to death.
3681.—Lieut. Statesman (?) taken prisoner.
?.—Lieut. Follit, killed; F. D. Kirkham, slightly wounded.
2949.—Captain Allan, killed; Lieut. Mactavish, wounded and taken prisoner.
A.2916.—Both passengers killed.

In 13 B.E. aeroplanes the number of the aeroplane and the name of the passengers could not be ascertained.

16 Sopwith Two-seaters.

A.2401.—Sergeant Dunne; Lieut. Warrens; one of the passengers killed, the other taken prisoner.
A.1073.—The pilot taken prisoner; the observer killed.
A.3421.—Lieut. A. G. Pepper, taken prisoner; Lieut. W. L. Day, killed.
7675.—Both passengers killed.
(Fixed engine) 7544.—Both passengers killed.
?.—Lieut. Wordsworth; both passengers killed.
7806.—Both passengers killed.
?.—Lieut. Heagerty, wounded; Lieut. Health Cantle, killed.
5117.—Sec. Lieut. Harold Edwards, taken prisoner; Gunner Coghlan, killed.
5171.—Lieut.-Col. Rathborne, taken prisoner unwounded; Gunner Turner, killed.
A.3323.—Pilot wounded; observer killed.
A.1089.—Sec. Lieut. Newenhem, taken prisoner, slightly wounded; Sec. Lieut. A. E. Crisp, taken prisoner.
A.9934.—Lieut. Cliford Reece; Sergeant Wilh. Moult; taken prisoners, the latter wounded.

In 3 Sopwith two-seaters the number of the aeroplane and the names of the passengers could not be ascertainel.

8 Sopwith Single-seaters.

? Motor: Mercédès. Sec. Lieut. Fasker, taken prisoner.
22 Type II.—Passenger taken prisoner.
A.6690.—Lieut. Roche, taken prisoner unwounded.
3.6175.—Lieut. Capon, taken prisoner, slightly wounded.
A.6172.—Captain Mack, taken prisoner, severely wounded.
A.6160.—Sec. Lieut. Bennet, killed.
6175.—Lieut. Malone, 3rd Squadron, killed.

In 1 Sopwith single-seater the number of the biplane and the name of the pilot could not be ascertained.

1 Sopwith Triplane.

5448.—Lieut. Weil, killed.

27 F.Es.

4954.—Sub-Officer Wilson, Gunner Hadlow, taken prisoners.
5841.—Lieut. Powell, 13th Squadron, 12th Wing, and passenger, killed.
A.5151.—Capt. Tomlinson, slightly wounded; Lieut. Lenison, severely wounded.
A.6382.—Lieut. O'Beirne, killed; Lieut. Macdonald.
A.6371.—Lieut. Richards, killed; Lieut. Dodson, taken prisoner.
A.808.—Lieut. Musters, Sec. Lieut. Brandon, both killed.
A.805.—Sec. Lieut. Hinginbottom, severely wounded; Afflach, killed.
7714.—Lieut. Anley, slightly wounded; Mechanic Barnes.
A.21.—First Lieut. Birech (Birch ?) and Bongshield, both taken prisoners.
A.22.—Captain Shyber, N.G.
A.652.—Pilot Schreiber, Observer M. Lewis, both taken prisoners.
A.6.—Lieut. Hamilton, Gunner Snelling, both wounded.
?.—Lieut. Buttler, Mechanic Robert David, taken prisoners.
A.813.—Lieut. Callum, Lieut. Bell, both taken prisoners unwounded.
5969.—Shun and C. A. R., both killed.
4984.—Pilot and Observer taken prisoners, the former severely wounded; the latter unwounded.
(Fixed motor) 3759.—Lieut. M. A. Wood, Steward Thomas, both burnt to death.
1564.—M. Thopam, both passengers killed.
(Motor) 3577.—Lieut. George, Lieut. Bailly Hodson, both killed.
A.784.—Both passengers taken prisoners.
6385.—Lieut. H. R. Nikolsen, Cadet J. R. Johnston, both killed.
4883.—Both passengers taken prisoners.
A.825.—Names of the passengers unknown.
A.6355.—Lieut. Hondley and Lieut. Percival, both taken prisoners.

In 3 F.E. biplanes the numbers and the names of the passengers could not be ascertained.

5 Nieuport Two-seaters.

(? Rotary engine).—Sec. Lieut. Vaughan, F. Williams, both killed.
A.6667.—Sec. Lieut. Luscen and H. Pell, both killed.
N.6775.—Lieut. James and Melor, both killed.
9667.—Lieut. George Fleming, taken prisoner wounded; Pilot Lockyer, killed.
6671.—Lieut. Burbury, Worne, taken prisoners wounded.

19 Single-seaters.

6674.—Lieut. Sheape, 40th Squadron, taken prisoner.
A.6693.—First Lieut (?) severely wounded.
A.6692.—Sec. Lieut. Jennings.
4635.—The pilot taken prisoner.
2865.—The pilot killed.
A.6605.—Lieut. Rob. Bevington, taken prisoner, wounded.
A.6796.—Lieut. W. O. Russell, taken prisoner.
B.1511.—The pilot killed.
6772.—Capt. Alan Binnie, severely wounded.
2946.—The pilot killed.
3382.—The name of the pilot unknown.
A.313.—Lieut. A. Walter Wood, taken prisoner slightly wounded.
3192.—The pilot taken prisoner wounded.
(Rotary engine)—A. H. Hervey.

In five Nieuport single-seaters the number of the machine and the name of the pilot were not ascertainable.

13 Bristols.

7236.—The pilot killed, the observer severely wounded.
A.3340.—Lieut. Na. Nickler, severely wounded, and Lieut. George.
(Motor: Rolls-Royce) 10,426.—Lieut. Adams and Lieut. Steward, both wounded.
A.3320.—Lieut. H. A. Booker, severely wounded, and Alan Bolcheon, slightly wounded.
?.—Capt. Robinson, taken prisoner, and Lieut. Warberton.
A.3323.—Lieut. Brockhurst and Lieut. Broughton.
A.3338.—Capt. A. Tidmarsh and Lieut. Hollond, both taken prisoners.
9625.—Both passengers killed.
3199.—Watson and Law, wounded.
3322.—Sec. Lieut. Worshey, Sec. Lieut. Davis, taken prisoners, unwounded.
7195.—First Lieut. Hicks, taken prisoner.
A.2937.—Passengers killed.
Belgian No. 17.—Lieut. Jules Callant, Adjudant Armand Glibert, both killed.

4 Spads.

A.6681.—Pilot killed.
6753.—Lieut. W. L. Hamilton, taken prisoner.
B. 1562.—D. L. D. Davidson.
6682.—Sec. Lieut. Craig, taken prisoner.

11 Vickers.

4997.—Lieut. Bates and Barnes, both killed.
(? Motor: Rolls-Royce) 3 250 59.—Lieut. Sworder, killed, and Lieut. Menghirth.
A.4 1959.—First Lieut. Barrell, taken prisoner, the other passenger severely wounded.
5150.—Passengers of the 57th Squadron, killed.
A.19.—Sergt. Attwater and Lieut. Davis, both slightly wounded.
6391.—Sec. Lieut. Khondhzon (?), Sec. Lieut. Burns, 20th Squadron, taken prisoners, unwounded.
A.6352.—John Lingard and Edward R. Jennings, both taken prisoners.

In four Vickers the numbers and the names of the passengers were not ascertainable.

Also two tractor biplanes. Their numbers and the names of the passengers were not ascertainable.

1 tractor biplane: A.2592.—Lieut. Ross, severely wounded.

1 Martinsyde single-seater: G.100.—Lieut. J. B. Lasher, taken prisoner unwounded.

1 triplane: 5457.—One Sec. Lieut. taken prisoner

2 triplanes: Their numbers and the names of the passengers were not ascertainable.

1 "Zanzibar" VII: 7714.—Passengers not ascertainable.

1 R.E.8. ?.—The passengers taken prisoners.

The numbers, and/or names of passengers of 32 French Avions, and Russian, are given in the same list.

* * *

The list of Allied aeroplanes which fell into the hands of the Germans during May, 1917, gives 113 machines in all: 89 British, 21 French, 1 Belgian and 2 Russian.

8 Sopwith Two-seaters.

B.1597.—Unknown.

A.8252.—Lieut. O'Brien and Lieut. Edwards, both taken prisoners.

? (Motor: Clerget 1259).—J. L. Pischott, wounded; F. H. Adams, killed.

7803.—Lieut. Nills, killed; Gunner Lengblan, wounded.

3552.—Lieut. F. H. Woolliam and Lieut. J. B. Harvey, both taken prisoners.

3a 963.—Sec. Lieut. Johnstone, wounded; Sec. Lieut. Thomas Snipson Millar, taken prisoner.

A.8226.—Allan S. Carey and William Arthur Laidranck, killed.

In one Sopwith two-seater the number and the names of the passengers could not be ascertained.

21 Sopwith Single-seaters.

N.6186.—Lieut. Arthur Stuart Nather, taken prisoner, unwounded.

R.W.72.—H. S. Morton, taken prisoner, unwounded.

?.—Lieut. R. M. Musters, killed.

6174.—Lieut. Hadrill, taken prisoner, unwounded.

A.7303.—Lt. D. T. Sheehan, killed.

A.6178.—Lieut. H. Thomas Wicket, severely wounded.

N.6464.—Lieut. J. Bampfylde, taken prisoner, unwounded.

Motor: Gnôme-le Rhône, No. 100221.)—British Sergeant, without identity sign, killed.

A.6776.—Lieut. Gilchrist.

(Motor: Le Rhône, 7980.)—The pilot killed.

B.1721.—Lieut. F. N. Kantel, taken prisoner.

(Motor: Le Rhône, No. 100235.)—Lieut. R. M. Roberts, taken prisoner.

? (Motor: le Rhône, No. 2764.)—Sec. Lieut. Sutherland, taken prisoner.

A.6158.—N.C.O. Walker, taken prisoner unwounded.

A.6186.—The name of the pilot not ascertainable.

A.6194.—Capt. Lucas Smith, wounded.

?—Lieut. Hains, killed.

A.2 8902.—Lieut. Toogood, wounded.

A.6186.—Lieut. Charles Smith, taken prisoner.

In 2 single-seaters the numbers of the machines and the names of the pilots were not ascertainable.

1 Sopwith Triplane Two-seater.

7419.—Sergt. Walter Bond, Lieut, T. Welby, both killed.

7 Sopwith Triplane Single-seaters.

5474.—Lieut. Roach, killed.

(Motor: Hispano-Suiza, No. 10046.)—Capt. Ball, killed. (One doubts if it was a Sopwith of any kind.)

A.973.—The pilot killed.

(Motor: Clerget No. 386.)—The pilot killed.

N.5450.—Smith killed.

(Motor: Clerget No. 1597.)—The pilot unknown.

(Motor No. 2779.)—The pilot unknown.

14 F.E. Two-seaters.

?—Lieut. G. French and Lieut. Hording.

A.5149.—First Lieut. Arthur W. Martins, Gunner Private Blakes, both taken prisoners.

?—M. Kaiser wounded.

?—Lieut, Lee and Gunner Boomeister, both taken prisoners.

(?) 5.—The passengers killed.

A.6446.—Lieut. E. James Grout and Alex R. Tyrell, taken prisoners.

A.6447.—Lieut. B. C. Moody, Sec. Lieut. F. D. Blakall, slightly wounded.

5511.—Lieut. Thomas Hudson and Capt. L. M. Horncastle, both killed.

9524.—Lieut. Johns, severely wounded; and Sergt. Alfred, killed.

?—Lieut. F. W. Evans, and Lieut. Masson, both killed.

A.7374.—Lieut. Holman, severely wounded, the second passenger killed.

A.6378.—The names of the passengers unknown.

A.32.—The names of the passengers unknown.

In 1 F.E. biplane number and passengers not ascertainable.

F.E. Single-seater.

2622.—The pilot severely wounded.

10 Nieuport Single-seaters.

B.1514.—The pilot taken prisoner.

A.6665. Sergt. Henri Dunb (?) taken prisoner.

A.6644.—Sec. Lieut. S. H. Lines, taken prisoner unwounded.

2942.—Lieut. Raymund, taken prisoner.

3761.—Lieut. Cole, killed.

A.6678.—Lieut. R. J. Anthony, killed.

(Motor: le Rhone, No. 6284).—Lieut. Mackintosh, prisoner.

A.4.—Lieut. Robertson, taken prisoner.

In 2 Nieuport biplanes numbers and pilots not ascertainable.

6 B.E. Two-seaters.

4968.—The passengers killed.

A.2801.—Both passengers killed.

(Motor: Rolls-Royce 3243.)—Lieut. Brisel and Sergeant Adam, killed. (Probably not a B.E.)

3474.—Lieut. Osborne and Sergt. Lewis, taken prisoners.

(Motor: Rolls-Royce, No. 4260-146.)—Lieut. Rozer Palner Percy and Lieut. Edward Seffery Roland, killed.

In 1 B.E. biplane number and passengers not ascertainable.

2 Bristol Single-seaters.

B.5/2515.—The pilot killed.

(Motor: Hispano-Suiza, No. 10020).—Lieut. G. B. Daniell, taken prisoner unwounded.

3 Vickers Two-seaters.

(Motor: Rolls-Royce).—Sec. Lieut. Bacon, wounded; Lieut. Committio (?) killed.

A.3608.—Lieut. Harold Kirby and Lieut. Thomas Wade, taken prisoners.

A.6410.—The passengers unknown.

2 Vickers Single-seaters.

7622.—Lieut. Fraser, taken prisoner unwounded.

4873.—Captain S. F. Browning, killed.

2 Spad Two-seaters (?).

N.B.— 1588.—Lieut. John Duncan and Lieut. Vernon Holmes, both taken prisoners.

B.1627.—Sec. Lieut. Stanley Franck and Allobarton, both taken prisoners, unwounded.

3 Spad Single-seaters.

5280.—First Lieut. Cecil Ernst French, taken prisoner, unwounded.

In 2 Spad single-seaters the numbers and names of pilots were not ascertainable.

2 S.Es.

734.—Lieut. Hume, taken prisoner.

A.8905.—Lieut. Edgar A. Lloyd, wounded.

1 R.E. Two-seater.—Lieua.— Ernst Moore and Lieut. William Winkler.

1 Farman (?) (Motor: Beardmore No. 4425).—Passengers unknown.

1 de Havilland Scout.—J. H. H. H. Godall, taken prisoner, unwounded.

1 Tractor Biplane: A.7416.—Sec. Lt. Beavanto Pill and Sec. Lieut. G. S. Stroboyde (?), both killed.

3 British Aeroplanes (Motor: Beardmore 1411).—Mechanic Echens; the second passenger unknown, both killed.

The numbers of the two others and the names of their passengers not ascertainable.

This list gives also 21 French avions, which include 10 Spads, 7 Nieuports, 1 Sopwith single-seater, 1 Morane parasol, 1 Paul Schmidt biplane, 1 Moineau biplane, and 1 Voisin.

* * *

The "Daily Express" published on July 28th a list of British air losses in June which was published in the official "Norddeutsche Allgemeine Zeitung," of Berlin. The total number of machines mentioned in 83. The list is as follows:—

4 Sopwith Two-seaters.

...No. A.1012.—Lt. R. Neill, Lt. S. N. Harley, both dead.

(Motor Clerget) No. W.D.6291.—Occupants dead.

No.A.8280.—Lt. Smith, Cpl. Thowsen, both prisoners.

No. B.1750.—Occupants unknown.

22 One-seaters.

No. B.1583.—Sec. Lt. Stewardson, prisoner.

No. A.6204.—Lt. David Cameron, prisoner.

No. 4632.—Occupant dead.

No. 9625.—Occupant dead.

(Motor Clerget) No. 1293 R.—Occupant dead.

(Motor Wolseley Hispano, 684/2233).—Capt. T. Malcolm Dickenson, wounded.

No. A.1566.—Douglas D. Steeves, wounded.

No. 5025/1252.—Occupant dead.

(Rotary engine) No. 35021/4694.—Lt. Chalmers, prisoner.

No. A.8899.—Lt. Harold Hamer, dead.

No. B.1730/1439.—Major C. E. Sutcliffe, dead.

No. A.7306.—E. Y. J. Grevelink, dead.

No. unknown.—Lt. March, prisoner.
No. A.6207.—Sec. Lt. Robertson, dead.
No. B.1745.—Sec. Lt. Shirley, dead.
No. 6362. Lt. F. W. Smith, dead.
No. A.8919.—Lt. Rogerson, prisoner.
No. unknown.—Lt. R. Illis, dead.
No. B.V.H.—A. Iondes (?Ionides), dead.
In the case of three of the Sopwith one-seaters the numbers of the machines and the names of the occupants were undecipherable.

1 SOPWITH TRIPLANE TWO-SEATER.

No. 6293.—Occupants dead.

5 SOPWITH ONE-SEATERS.

(Motor Clerget).—Lt. Parker, dead.
No. N.6306, L.A.T.—Lt. Holcroft, wounded.
No. 5358.—Lt. Girling Robert, dead.
No. 5376.—Lt. G. Nash, wounded.
In the case of one Sopwith triplane the number of the machine and the names of the occupants were undecipherable.

20 NIEUPORTS—ONE-SEATERS.

No. A.6675.—Sec. Lt. F. Darrie, prisoner.
No. 3491.—Lt. Waters, prisoner.
No. B.1548.—Occupant unknown.
No. 3204.—Lt. F. P. Reeves.
No. unknown.—Lt. Shaw, prisoner.
No. B.1674/3453.—Occupant unknown.
No. 2900.—Lt. Boote, prisoner.
(Motor Rhone) No. 7494.—Sec. Lt. Slee, prisoner.
No. B.3481.—Occupant wounded.
No. B.1550.—Lt. Mussared, prisoner.
No. B.1689.—Lt. Anderson, dead.
No. 3443.—David Rhys Cadwgan Lloyd, dead.
No. 1680.—Lt. George Carman Aiknis, prisoner.
No. B.3495.—Jerrat, prisoner.
No. unknown.—Sec. Lt. G. T. Harker, prisoner.
No. B.1607.—Lt. Smith, dead.
No. B.1572.—Sec. Lt. Bird, dead.
No. A.6718.—Lt. D. C. G. Murray, prisoner.
In the case of two Nieuport one-seaters the numbers of the machines and the names of the occupants were undecipherable.

7 SPADS—ONE-SEATERS.

No. A.6157.—Lt. A. J. Mitschel (sic), wounded.
No. B.1524.—Lt. Illingworth, wounded.
No. B.3460.—Sec. Lt. Count L. T. B. di Balme.
No. B.3504.—Capt. Davids, prisoner.
No. B.1663.—Lt. Maurice Lowe, dead.
In the case of two Spad one-seaters the numbers of the machines and the names of the occupants were undecipherable.

2 F.E. TWO-SEATERS.

No. B.1.A.857.—Capt. F. P. Don, Lt. Harries; both prisoners.
No. unknown.—Lt. Pollard, wounded; Lt. Ferriman, dead.

4 ONE-SEATERS.

No. 4887.—Lt. P. E. Stacpole O'Longan, dead.
No. unknown.—Occupant Hair, prisoner.
In the case of two F.E. one-seaters the numbers of the machines and the names of the occupants were not decipherable.

4 R.E. TWO-SEATERS.

(Stationary motor).—Lt. C. W. Devenish, Lt. H. S. R. Cottenil (sic), both dead.
No. unknown.—Lt. Philipp, dead; second occupant not found.
In the case of two R.E. two-seaters the numbers of the machines and the names of the occupants were not decipherable.

2 ONE-SEATERS.

Two R.E. one-seaters, in which the numbers of the machines and the names of the occupants were undecipherable.

5 S.E.—ONE-SEATERS.

(Rotary motor), No. 4858.—Occupant dead.
No. 4862.—Lt. Spearpont, prisoner.
No. A.8922.—Occupant, prisoner.
No. A.C.3.—Lt. W. Turner-Coles, prisoner.
In the case of one S.E. one-seater the number of the machine and the name of the occupant were undecipherable.

3 B.Es.—TWO-SEATERS.

No. A.3162.—Lt. Bowe, dead; Lieut. Lister, wounded.
No. 24522.—C. B. Lt. O'Brien, dead; Sergt. Mollison, prisoner.
No. 2800.—Lt. Fred Vipon, Lt. George Simon, both prisoners.

1 VICKERS—ONE-SEATER.

No. A.4925.—Lt. Sturgess, prisoner.

1 D.D.—TWO-SEATER.

(Motor Rolls-Royce), No. 4250147.—Cpl. Thomson, Lt. Smith; both dead.

1 MARTINSYDE—ONE-SEATER.

No. unknown.—Sec. Lt. Stures, prisoner.

1 DE HAVILLAND—SCOUT.

No. uncertain.—Capt. of the 25th Squadron, burnt to death.

* * *

During the month of June Sir Douglas Haig, in his official reports, recorded the bringing down of 101 German aeroplanes, and that a further 76 were driven down out of control.

It should be noted that these names and numbers above represent actually the machines in the hands of the Germans, and take no account of machines crashed, or of aviators killed or wounded on our own side of the lines.

IN MEMORIAM.

When I heard that he was dead, I was stunned.

When I heard what he had done before dying, I was proud.

When I thought of what he had been to me while he was still alive, I was glad.

Death is a commonplace.

As surely as we were born, so surely must we die.

He was young; he was clean; he was strong.

He lived his life—short as it was—to the full.

Who am I to regret a glorious end to him who was my friend?

Yet I am selfish: I want to see him, to hear his voice, to watch his face light up as he sees me.

Certainly, I am foolish.

He is gone into the Unseen, where I shall one day follow him and the more willingly because he has gone before me.

I am lonely without my friend, he had my confidence.

He knew my faults and loved me the better for them.

My thoughts were all of him, and of how I could make him happy.

But now I cannot make him happy, and whether he is happy, I do not know.

I am rebellious, but I am impotent.

Death has defeated me of my friend, but it cannot wipe out the memory of our friendship.

And when I die, shall I not see him again?

Who knows? Who really knows?

When I heard he was dead, I was stunned.

When I heard what he had done before he died, I was proud.

When I thought of what he had been to me while he was still alive, I was glad. H.

WAR WORK.

The Ministry of Munitions has shown its appreciation of the training school for women welders at Notting Hill Gate, which was organised by Women's Service, 58, Victoria Street, S.W.1, by taking over all payments and expenses in connection with it. The Ministry will not interfere with the running of the school, which is acknowledged to be the best of its kind, nor with the selection of the pupils and their subsequent placing. The Ministry took this step as the result of an inspection of the school, when it was found that, not only were the pupils, all educated women, better taught, but that the school was run more economically than those already under the control of the Ministry. As it was the desire of the Ministry that the training should not be charged for, and as the Women's Service could not afford to give it free, the Ministry undertook all charges on conditions that 20 pupils should be constantly in training.

The new arrangements are working well. The Ministry have added new blow-pipes and plant, and the securing of sufficient oxygen, acetylene gas, and scrap metal is no longer a difficulty. About 200 skilled welders have been trained in the school, which has already been described in the "Times." When trained they receive a wage of 8d. an hour, and after three months the men's minimum rate, which gives them an average of £2 10s. to £3 a week.

Aluminium welding is also being taught with success. It is difficult, but the women are doing well in aeroplane factories. The students are booked two or three weeks ahead of the completion of their training.

R.F.C. STAFF BADGES.

The following distinctions in dress have been approved for Staff officers of the Royal Flying Corps:—

Gorget patches.—French grey cloth with line of crimson gimp and small Royal Flying Corps button.

Cap-band.—Band of French grey cloth to be worn with the forage cap of the Royal Flying Corps. A cover of drab material to be fitted to the forage cap so as to show the badge, band, and peak.

AIRCRAFT IN THE HOUSE.

On July 17th, **Mr. G. Faber** asked the **Chancellor of the Exchequer** whether the Commander-in-Chief in this country, or who, was primarily responsible for the safeguarding from treacherous tampering by persons living in this country with military airships and aeroplanes situated or operating here; and whether, in view of the ever-increasing importance of this branch of the air service, he would consider the desirability of some official or officer being forthwith appointed whose chief duty it should be to see that no possible precautions were omitted whereby such treachery could be guarded against.

Mr. Macpherson (Ross and Cromarty, L.), who replied, said: General officers commanding-in-chief commands are responsible under the direction of the Field Marshal Commander-in-Chief, Home Forces. It is not considered necessary to make any alteration in the system such as my hon. friend suggests. **Mr. Pemberton-Billing**: As this is a very grave and serious matter, which has caused considerable dissatisfaction, will the hon. Member at least ask the Department to give it very serious consideration? **Mr. Macpherson**: I can assure my hon. friend and the House that the War Cabinet and the Committee over which the Prime Minister presides will make the necessary inquiry. **Mr. G. Faber**: May we be assured that the report will come in time, and not too late? (Hear, hear.) **Mr. Macpherson**: I hope so.

[It would be interesting to know how this absurd yarn about someone having tampered with machines originated. One is almost tempted to think that it came from some aviator or other who did not quite relish the idea of going up to attack raiders and came home in a hurry with this excuse.—Ed.]

Mr. H. Samuel (Yorkshire, Cleveland): Are we to understand that the Committee which has just been mentioned by the Under Secretary for War, and which is presided over by the Prime Minister, is a Committee which will inquire into the matter mentioned in this question, or is it the Committee already announced that is to inquire into the air defences of London generally? **Mr. Macpherson**: It is an inquiry into the defences of London, and, I understand, into such other matters as are germane.

Aerodromes (Employment of German Prisoners).

On July 20th, **Mr. Billing** asked whether German prisoners are being employed at an aerodrome as mechanics or in any other capacity? **Mr. Macpherson**: German prisoners are being employed on the construction of aerodromes, etc., and not otherwise. Their employment has been found necessary in cases where free labour is scarce or difficult to procure, in order that the completion of these urgent works may not be delayed.

Mr. Billing: Is the hon. gentleman aware that in aerodromes throughout the country—I put several names in the question which do not appear—these German prisoners are employed, and in aerodromes which are actually engaged in the defence of this country, and will the machines have to be used—— **The Speaker**: The hon. Member is now making a statement. **Mr. Billing**: May I ask whether the hon. gentleman is prepared to issue an immediate order to remove all German prisoners, and all Germans, from the precincts of aerodromes in which Home Service Defence machines are stationed?

Mr. Macpherson: I will have that matter very carefully considered, and will place my right hon. friend's representations before the military authorities. But I should like to say that my information is quite definite that no German prisoners are employed in existing aerodromes. They are employed on construction work. **Mr. Sherwell**: Will the hon. gentleman make special inquiry as to whether, as a matter of fact, German prisoners were not employed in the grounds of a special aerodrome near London last Saturday? **Mr. Macpherson**: I shall certainly do so.

On July 24th, in answer to **Sir H. Dalziel, Mr. Macpherson** said: Telescopes are provided for the purpose of identifying aircraft. None of our machines were shot down by our guns on July 7th.

Mr. Bonar Law, replying to **Col. C. Lowther,** who asked whether the Government could form any estimate of the monthly output of aeroplanes in Germany, and whether they were keeping pace with that output, said: The answer to the first part of the question is in the negative. As regards the last part of the question, it is not so much a question of keeping pace as of producing machines in the greatest quantity possible.

Col. Lowther: Are the Government satisfied that there are sufficient aircraft in this country to prevent a repetition of what occurred the other day? **Mr. Bonar Law**: The Government are satisfied that they are doing everything in their power to meet all possible needs. **Mr. Lynch** (Clare, W., Nat.): Is the right hon. gentleman aware that Germany is abandoning the construction of Zeppelins in order the better to concentrate on aeroplanes? **Mr. Bonar Law**: I don't see what difference that makes. If we are producing all we can we cannot, whatever the Germans do, produce more.

[Doubtless "varra humorous" from Mr. Law's point of view, but not in the least convincing to those who know how much more we might produce if we went the right way to work.—Ed.]

Mr. Rowlands asked, whether, in the evidence given at the coroner's inquest at Dartford on Lt. Salmon, who was killed in the air raid on July 7th, reference was made to an aviator who was shot in the neck and killed in the previous air raid, how did this occur, and was there any reason why this man's name should not be known?

Mr. Macpherson said that First-class Mechanic James O. Jessop was killed in action during the air raid on July 4th. His name appeared in the dispatches for gallant and distinguished service in the "London Gazette" published on July 18th.

Number of Raids.

On July 25th **Mr. Macpherson,** replying to **Mr. Billing,** said: Since the outbreak of war 47 airship raids and 30 "heavier-than-air" raids have taken place in this country. No official communiqué was published in the Press with regard to the first six airship raids, up till the middle of May, 1915. Press reports of the fullest character were, however, published. After the middle of May Press reports were forbidden. With regard to the seven following raids, up till the middle of August, Admiralty communiqués were published. The next seven raids, till the end of 1915, were published through Press Bureau reports. The remaining raids, from the beginning of 1916 till the present time, have all been published by means of official military reports issued by the War Office or the Field-Marshal Commanding-in-Chief, Home Forces, with the exception of one in which an airship is doubtfully reported as having appeared only for a few minutes over the coast and dropped no bombs. Of the "heavier-than-air" raids, the first two in 1914 were published by means of official communiqués. During the first half of 1915 no official communiqué was published in the Press with regard to the two raids that occurred, but full Press reports were allowed to be published. The only other raid that occurred in 1915 was published in an Admiralty communiqué. The remaining raids in 1916 and 1917 have all been published in military communiqués so far as they concern the sphere of action of the Field-Marshal Commanding-in-Chief, Home Forces, and wherever the enemy's activity has actually extended over land.

Mr. Macpherson, in answer to another inquiry by **Mr. Billing,** said: I am informed that the total casualties among soldiers, sailors, and civilians caused by the raid of Sunday, July 22nd, were:—Killed, 13; wounded, 26. None of our own aviators was brought down by the enemy or crashed in any manner whatsoever. None of the enemy aircraft was shot down or brought down in this country.

Sir G. Cave (Surrey, Kingston), replying to **Mr. Gilbert** (Newington, W., L.), who asked what form of warning against air raids in London had been decided on, said: Warning will be given by signal rockets to be fired from certain Fire Brigade stations and police stations, as already announced. As a result of the experience gained last Sunday, it is proposed to reduce the number of signals to be fired at each station from three to two, and also to give a signal by whistle or otherwise when all is clear. A police notice will be issued forthwith.

On July 26th **Sir H. Dalziel** (Kirkcaldy Burghs, L.), answering **Sir G. Cave** (Kingston, Surrey), said: I am in consultation with the Admiralty and Army Council as to the desirability of taking steps under the Aliens Restriction Order for prohibiting any alien enemy from residing in the vicinity of an aerodrome, but such prohibition (if issued) would affect aliens only and not British subjects of enemy origin. These persons, if they are suspect, can be removed from any area by order of the naval or military authority under Article 14 of the Defence of the Realm Regulations.

On July 30th **Sir G. Cave** (Kingston, U.), responding to a request made by **Sir S. Coats** (Wimbledon, U.) that he would supply the complete figures of those killed and injured in hostile air raids and in street accidents in the London metropolitan area from the commencement of the war to date, said: The figures are as follows:—Killed in air raids, 366; killed in street accidents, 2,412; injured in air raids, 1,092; injured in street accidents, 70,863. These figures include all persons killed and injured in air raids in the Metropolitan Police district and the City of London up to the present date. The figures of street accidents are given up to June 30th in the Metropolitan Police district and to July 22nd in the City of London, these being the latest dates for which figures are available.

Orders to Fly.

Mr. Macpherson, replying to **Sir H. Dalziel** (Kirkcaldy Burghs, L.), who asked whether, notwithstanding the importance of our aviators getting up in the air as speedily as possible on the approach of enemy machines, they were constantly kept below waiting for orders from a distant authority; and, if so, whether he would at once give instructions for the officers at the various aerodromes when a raid was in progress to act on their own initiative, said: The answer to both parts of my right hon. friend's question is in the negative.

The Vote of Credit.

On July 26th, the House went into Committee of Supply on the Supplementary Vote of Credit of £650,000,000.

The Chancellor of the Exchequer said:—I rise to move the Vote of Credit of which notice has already been given. The amount is £650,000,000, which exceeds by £150,000,000 the largest sum previously asked for in this House.

On the subject of aeroplanes he said:—

In addition, there has been a slightly increased expenditure on aeroplanes. This is due, of course, to this fact alone, that output has increased more rapidly than was anticipated at the time that the Budget was framed.

THE ALMS OF THE LAW IN CANADA.

(Reprinted with acknowledgments to "Aerial Age," New York.)

There was a time in Canada when a man engaged in aeronautical work was singularly immune from the law. In fact, it is related that Tony Janus, in the spring of 1915, used a Henry Special (Ford), to travel between Toronto and the Aerodrome of the "Canadian Aeroplanes, Limited." As Tony was always in a hurry he made the Ford travel its limit until one day he was reported for speeding. At one hearing he had *seven reports,* but the Judge, on hearing that Mr. Janus was engaged in teaching aviation, and building aeroplanes for the Allies, said: "We must be lenient to these fellows, as they are here to help us win the war." He dismissed the case. It seems that now the Canadian judges must have become confident of winning the war, as they refuse to forgive speeders any more.

The chief pilot of the Canadian Aeroplanes, Limited, Mr. Harry J. Webster, made a trip from Toronto to Buffalo the other day, and on the way through Burlington, Ont., was reported for speeding, and summoned to answer the charge. Mr. Webster inquired if he pleaded guilty, would he need to appear for hearing, and in answer to his letter received the following, absorbingly interesting, from the Police Magistrate:—

H. J. W. Burlington, Ont., May 7th.

Dear Sir,—Yours of the 4th before me. When you plead guilty you can settle without coming. My paper says you were speeding at 35 miles per hour. If it is the first offence the fine will be—Fine, $10.00; cost, $3.05 equals $13.05. If it is a second offence it will be $5 more. Please send an Express order And Oblije

W. J. Barr, P.M.

(P.M. means Police Magistrate, not Post Meridian.)

FAIR CRITICISM.

The Cologne "Volkszeitung" remarks with regard to American participation in aerial warfare:—

"Reuter is coolly spreading the information that the American Ministry has laid a proposal before the military committee of the Chamber of Deputies in favour of the immediate construction of 22,625 aeroplanes.

"One is really at a loss to comprehend the object of spreading such information. Can any cool, reasoning Frenchman take it seriously? Just imagine a miserable trifle of 22,625 aeroplanes —mind the odd five. Who is to build them, we should like to know; whence are the practised pilots to be found for so many machines?

"It may readily be admitted that Americans will do their best to help their terribly distressed allies, but even the Yankees will not be able to manage things so quickly as this.

"So far as the German public is concerned, the Americans and the English may keep such childish tales to themselves. The Germans are much too cool-headed to be taken in by them."

A USEFUL FLYING ACCESSORY.

The problem of writing notes in the air has not been in the past so simple as such an automatic operation would appear to be. In the first place, even for a passenger, who has nothing particular to distract his attention or employ his hands in any other direction, the matter is one of considerable difficulty, even in a machine which is well protected from the wind, and writing materials are apt to be disturbed. Also, in the average aeroplane, there is no particular place where a writing-pad can conveniently be kept, and as likely as not, when out of use, it will be placed on the floor of the machine, and may slide out of reach of the user and possibly into a puddle of grease.

As regards pilots, both of single and multi-seated machines, still greater inconvenience is experienced. As a rule, any writing slope provided does not suit the reach of every length of arm, and in any case it is rather extraordinary how few people can write legibly, even on the ground, with the use of one hand only, there being a curious kind of instinct to grab the paper with the other hand whether it is fixed or not.

For military purposes, the taking of copious notes is very necessary, and any device which will assist in this direction will be welcomed. The solution of the problem seems to have been solved very effectively by Mr. W. R. Turnbull, of Fredk. Sage and Co., Ltd., who has recently patented a device, the simplicity of which is probably the reason why no one has ever troubled to patent it before. The patent consists essentially of a writing-pad which is capable of being strapped onto the forearm. In practice, it is a writing-pad with an aluminium frame, the back of which is curved to conform with the shape of the human arm. As can be seen in the illustration, it is attached by a couple of elastic straps. The whole device is very light and takes no room in the pocket when out of use.

The Turnbull Note-Pad in Use.

The points claimed for this writing-pad are that it is worn where it forms no kind of obstruction to any portion whatsoever, it cannot be dropped, and the arm constitutes a firm support, which can be held in any position most convenient to the writer, and it presents the outstanding advantage that, while in use, the wheel or control stick of a machine can be operated with the left hand.

Naturally, the use of this attachment is not confined to aircraft, and it presents great possibilities for motoring, navigating, surveying, and, in fact, in all kinds of outdoor work. One recollects a tragedy which happened many years ago to a well-known aeronautical engineer, who, while engaged on mining engineering in South America, dropped an ordinary note book, containing the result of nine months' work, into the river. By something approaching a miracle this note book was picked up miles down the stream, but the incident was sufficient to make him appreciate the utility of Mr. Turnbull's invention.

The attachment has been placed on the market by Dunhills, Ltd., of Euston Road and Conduit Street, W., the price being extremely moderate, and its use is commended to all and sundry who are occupied with the different kinds of work specified above.

FOR AN INVALIDED OFFICER.

An editorial assistant is required on the staff of this paper. Much of the work will be out of doors, and pay will be arranged entirely according to the ability of the applicant. A knowledge of aircraft and keen interest in aeronautical subjects are essentials, and the ability to write literary English is desirable. Preference will be given to an R.F.C. officer invalided after active service. No journalists need apply.

THE PASSING OF A PIONEER.

An American aeronautical pioneer has passed away with the death of Mr. Tom W. Benoist, who was killed on June 14th in an accident on a tramcar. He was travelling to his office at Sandusky, Ohio, and, on approaching his destination, stuck his head out of one of the windows of the car. His forehead struck a telephone pole placed close to the track, and his skull was fractured.

Tom Benoist was one of the earliest aeroplane and flying-boat constructors in the United States, and many interesting machines were produced at his works and school at Sandusky. Some years ago he built several large passenger-carrying flying-boats, which were successfully used for sporting purposes. One of his latest efforts was a tractor biplane, with a sheet steel fuselage.

Tom Benoist was very popular in aeronautical circles in America, not only because of his work for aviation, but because of his genial personality and out-spokenness. He made many friends in this country during a short visit in 1915, and all who

THE FATE OF A DEPUTATION.

In reply to a telegram dispatched on July 18th at Tower Hill to the King, asking if His Majesty would consent to receive a deputation on air raids, and to deny the rumours as to alleged withdrawal of aeroplanes from London, the following telegram was duly received by Mr. Harry Biner, organiser of the People's Fairplay League :—

"In reply to your telegram of to-day I have to inform you that it is contrary to usage for the King to receive any deputation except on the advice of His Majesty's responsible Ministers. There is no truth whatever that any aeroplanes were withdrawn from London to give a display before His Majesty, or for any object connected with the King's visit to France.

"(Signed) "Stamfordham."

SAFEGUARDS.

On the occasion of recent raids powder and solid substances from unexploded bombs were found, and as their handling except under safeguards is attended by risk, the following directions drawn up by Dr. Sequeira, of the London Hospital, were issued for the guidance of the police and may be of public interest :—

(1) The removal of the powder from surfaces is best effected by a weak alkaline solution. One teaspoonful of bicarbonate of soda to a quart of water. Brushes should be used wet with such solution for brushing or dusting surfaces covered with the powder. If the powder can be washed down with a hose, this would suffice. The powder should not be mixed with ordinary dust, as it might be sent to a destructor and possibly cause damage. The explosive should be mixed with earth and buried. Where much of the material has to be removed, it would be best to consult the military authority on this point.

(2) It is better not to wear gloves to handle the powder, as the glove soon becomes penetrated with the powder, and the skin is more easily irritated. Moist rags are best employed to handle articles covered with the powder.

(3) If the skin of the hands is stained, an endeavour should be made to remove the stain at once with pumice stone and the soda solution. (One teaspoonful of bicarbonate of soda to a quart of water.)

(4) At the first sign of inflammation of the skin, i.e., small swellings containing fluid, and irritation, a doctor should be consulted.

THE AIRCRAFT WORKERS' SPORTS.—The chief cups given at the recent sports, and supplied by the Goldsmiths' and Silversmiths' Co., Ltd., of Regent Street.

DESECRATING THE DEAD.

A number of munition workers were summoned at Dartford yesterday for being in the unlawful possession of various parts of an aeroplane, and also a pilot's goggles and gloves. The case arose out of the air raid of July 7th, when Lieut. W. G. Salmon, R.F.C., was killed, and his machine fell near Dartford.

Capt. Herbert Sisons, Acting Squadron Commander, R.F.C., said the safety belt, which was taken from the pilot when he was removed from the machine, disappeared, and the gloves of the aviator were also missing.

Defendants said they took the things out of curiosity as mementoes.

The magistrates fined each defendant 20s., and the chairman remarked that he supposed they did not realise the seriousness of their offence.

A WAR INVESTMENT.

A prospectus is being issued which will offer to the public the new capital for the payment of the extensions of the business of Peter Hooker (Limited), manufacturers of aviation engines. The company, which was incorporated in 1900, has a share capital of £450,000, of which £150,000 are in Ordinary shares, 50,000 in Second Preference shares, and 250,000 in Seven per Cent. Cumulative Participating First Preference shares of £1 each. The company owns freehold land and buildings at Walthamstow covering an area of 26 acres, and employs over 1,500 workpeople, with a staff of over 250. Its present turnover is at the rate of £610,000 per annum, while its net profits for the half-year ended Jan. 31st last amounted to £34,000, or at the rate of £68,000 a year.

The £250,000 First Preference shares which will be offered to the public at 21s. 6d. per £1 share, are entitled, in addition to the Seven per Cent. Cumulative dividend (free of tax), to 25 per cent. of any surplus profits that may be distributed in any year up to a maximum of a further 5 per cent. dividend.

PRESENTATION AEROPLANES.

The Government of the Gold Coast have received a further sum of £1,500, subscribed by the Chiefs of Ashanti, for the purchase of a third aeroplane for presentation to the Royal Flying Corps.

A LONDON REPRISAL MEETING.

A meeting of the townspeople of Stoke Newington to demand air reprisals against the Germans has been arranged to take place in Clissold Park on August 2nd, at 7.30 p.m.

The Mayor, Mr. H. J. Ormond, will take the chair, and the main resolution will be proposed by Mr. G. H. Jones, L.C.C.

A CORRECTION.

In last week's issue of THE AEROPLANE the list of prize-winners at the Aircraft Workers' Sports, at Stamford Bridge, stated that the three-mile cycle race was won by Mr. C. G. Turner, of Handley-Page, Ltd. This statement was not correct, and one takes pleasure in stating that Mr. Turner is employed at Integral Propeller Co., Ltd. He won both the half-mile and the three-mile cycle race. The cycle race was one of the most successful events of the day, and Mr. Turner won well from some very fine opponents.

All Advertisements for the Miscellaneous Advertisement Columns MUST arrive at this office by first post on Saturday.

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PAGE & ROWLINGSON, Chartered Patent Agents (Consulting Engineer, Mr. S. E. Page, A.M.Inst.C.E.), 27, Chancery Lane, London, W.C. Tel. 332 Central.

Inventors advised free. Write for booklet.—King's Patent Agency, Ltd., 165, Queen Victoria Street, London. 30 years' references.

Stanley, Popplewell and Co., Patent Agents and Consulting Engineers. Applications for Patents attended to in all countries.—38, Chancery Lane, W.C. Telephone: 1763 Central. Circular free.

Henry Skerrett, Chartered Patent Agent, 24, Temple Row, Birmingham.—Patents, trade marks, and designs.

SITUATIONS VACANT.

Sheet Metal Workers for aeroplane work. Men on Government work or residing over 10 miles away need not apply. Good wages. Apply personally at 10 o'clock any day to the Aircraft Construction Co., Harley Aeroplane Works, Beckton Road, E. 'Phone: East 1300.

Buyer (chief) wanted by an important company under Government control. Must have had wide experience in engineering and general buying, and be able to show good credentials. No one on Government work need apply.—Applicants should reply through nearest Employment Exchange giving fullest particulars and stating salary required. Mention this paper and Box No. 2014.

Wanted—really live, energetic tool setters, tool fitters, good all-round fitters, and first-class storekeeper for aircraft works in London. Accessible from all parts. Only first-class men with at least 5 years' experience need apply. Good wages paid. Also a few turners and fitters, improvers. No one residing more than 10 miles away or already engaged on Government work need apply.—Apply in writing in the first instance to Box No. 2011, THE AEROPLANE, 166, Piccadilly, W.1.

Technical Clerks required for aeroplane factory, N.W. London. No one residing more than 10 miles away or already engaged on Government work need apply.—Write giving references, salary required, etc., to Box 2009, THE AEROPLANE, 166, Piccadilly, W.1.

Charge-hand required for aeroplane propeller factory. One used to making templates, setting out working drawings, and checking off completed propellers. No one residing more than 10 miles away or already engaged on Government work need apply.—Stanley Aviation Co., 67, Kingsland Road, London, E.2.

Sheet Metal Industry.—Production manager required for important firm in North-West London district, preference given to one used to press work and manufacturing of light gauge metal articles. Specialities of manufacture, aeroplane components, radiators, tanks, etc. Keen man required, good time-keeper, and one used to handling men and supervising production. Must have practical knowledge. Tip-top salary to tip-top man. No one residing more than 10 miles away or engaged on Government work need apply. Applications in writing. All communications will be treated as confidential.—Gallay Radiator Company, Ltd., 4-6, Scrubbs Lane, Willesden, N.W.10.

SITUATIONS WANTED.

Belgian, owner of large machine woodworking factory in invaded Belgium, with complete practical knowledge of woodcraft, good draughtsman, desires responsible position in aeroplane or similar factory.—Write Leon Convents, 105, Plane Street, Hull.

Lady, having practical commercial experience in aircraft, desires position where ability, tact, and organisation will be appreciated; strict disciplinarian.—Address Box 2010, THE AEROPLANE, 166, Piccadilly, W.1.

Works and Technical Manager desires engagement, 20 years' practical experience with leading firms: Aero-engine work a speciality. Box No. 2031, THE AEROPLANE, 166, Piccadilly, W.1.

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Energetic Engineer, now engaged as foreman over large fitting shop in leading aeroplane works, desires change. Thirteen years' tool-room and machine-shop practice with first-class companies. Capable organiser and can show results.—Box No. 2004, THE AEROPLANE, 166, Piccadilly, W.1.

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AIRCRAFT PARTS.

Tapes, Webs, Cords and Threads in all qualities, suitable for Aircraft Work. Delivery from stock.—John MacLennan and Co., 30, Newgate Street, London, E.C.1. (See Advertisement Page 345 and Buyers' Guide.)

Hardwood for Aeroplanes.—Specially Selected air-dried timber as supplied to leading constructors in Britain and the Continent. Silver Spruce, Ash, Poplar; Hickory and Ash Skids; Threeply; Thin Cedar and Mahogany for Floats; Walnut for Propellers.—William Malinson and Sons, Ltd., Hackney Road 'Phone, 3854 Central, 4770 Wall.

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Required—large quantities of dry walnut, mahogany, ash, beech, or similar cuttings.—Apply to R. C. Eustace and Co., 73, Three Mill Lane, Bromley-by-Bow, London, E.3.

Design and full working drawings required immediately for a fast scouting biplane.—Address full particulars to the Ruffy, Arnell & Baumann Aviation Co., Ltd., The London Aviation Ground, Acton, W.

Wanted, mahogany, teak, and walnut cuttings from builders', railway, and aircraft works.—Box No. 2001, THE AEROPLANE, 166, Piccadilly, W.1.

Applications are invited from firms able to manufacture flexible containers (or bags) for coal-gas, same to be made of balloon fabric or similar material. Immediate orders waiting. Box No. 2015, THE AEROPLANE, 166, Piccadilly, W.1.

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Model Aeroplane. — Flies ¼-mile, circ flight, 3s. 3d. carriage paid. "I can roughly recommend your machines." T monial from Dr. E. Adams, Union R Sheffield. Thousands satisfied. Testimor from all parts.—Dept. C, Bristol Model A plane Depot, Eastville, Bristol.

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British School of Aeronautics. — Air Engineering Course; Aero Design; Aero struction; Aero Draughtsmanship; Mecha Engineering. — Pennington's, 254, Ox Road, Manchester.

FOR SALE.

Aircraft Engineering Works for sale at in Hammersmith; spacious premises, g concern with excellent orders in hand.—A Box No. 2012, THE AEROPLANE, 166, P dilly, W.1.

Aeroplane Radiators.—The Gallay Radi Company, Limited, stock Aeroplane R tors. For the benefit of Constructors, supply radiators for experimental purpose a nominal cost. Advice given on suit types for the various approved engines. drawing office is always at our clients' posal.—198, Great Portland Street, don, W.1.

Walker's 150-h.p. size Fan Dynamometer engine testing. Offer wanted. Also quanti hose pipe.—"Aeroplane," 58, Compton St E.C.1.

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Abroad, 3 months, 4s. 4d.; 6 months, 8s. 8d.; 12 months, 17s. 4d.

ON THREE YEARS OF WAR.

Three years ago to-day we were all settling down to the idea that we were at war. Our fatuous Press correspondents were already sending back from the Belgian front stories of how the cowardly Germans were suffering at the hands of the brave Belgians. Our Fleet, thanks to Prince Louis of Battenberg and Mr. Winston Churchill, had already done the greatest thing it has done in the war—it had managed to be there before it was wanted. Our Expeditionary Force, the finest Army the world has seen since Cæsar's Legions, was on the point of embarkation. Our seaplanes, to all intents and purposes as good then as they are now, though less numerous, were already patrolling the Channel. And our comic though heroic little Flying Corps was preparing to fly the Channel with its weird collection of B.Es. with 70-h.p. Renaults, Blériots, and Farmans with 80-h.p. Gnômes, and its one or two Sopwith tabloids and Bristol bullets—five squadrons nominally, and something like fifty machines all told.

Compared with the German flying service, our air forces would have been a tragedy, but for the comic element. Before the war Germany had fostered aeronautics in every possible way. The German Emperor himself had given prizes for engine competitions. The German High Command had encouraged German officers to fly in competition with professional aviators, when our officials were forbidden not only to fly in competitions, but even to arrive at or start from public aerodromes when the mere mob was present.

Despite the elementary state of aeroplane and engine design, the R.F.C. authorities were already trying to standardise officially produced types, and were discouraging private enterprise in every possible way. Thanks to the Admiralty Air Department, urged by Mr. Churchill and Commodore Sueter, a competition for British engines was in progress when war broke out, and several firms, which would otherwise have expired, were encouraged to produce new and improved designs, chiefly in seaplanes. But even the R.N.A.S. was misled by its technical people, and so wasted much valuable labour and material on obviously useless types, both before and after the outbreak of war.

Germany, on the contrary, had encouraged private enterprise, had ordered aeroplanes in quantities from commercial firms, and had never attempted to establish an official monopoly of design. The German military aviators had been carefully trained in squadron flying, in photography, in reconnaissance, and, above all, in artillery observation. Consequently, when war broke out, Germany was able to supply aeroplanes which did their work adequately on all the fronts. They dominated the Russian front completely, and at least they held their own on the French and British front. They did not attempt to fight, but any soldier who took part in the fighting during the retreat from Mons will bear witness to the high efficiency of the German artillery control.

Every one of us who took any interest in military affairs knew for years before that this war was bound to come, yet the Germans were prepared and we were not. As a result, we have paid in blood instead of in brains for our lessons. Unfortunately, those who should have paid in brains are still with us, and those whose blood has paid for the sins of omission have gone from us. Still, we have learned a few lessons which may be useful in future.

Some of Our Lessons.

From a purely personal point of view it seems to me that the chief lessons of the past three years are that there is no room in the world for small nations, that democracy is a wash-out, that the biggest empire with the biggest air fleet will be the master of the world in the future, and that such an empire is the only possible guarantee of the world's peace.

Universal brotherhood is a wildly impossible dream till such time as it pleases the Creator to re-create the human animal. All predatory animals have their eyes close together in the front of their heads, their sole object being to see their prey. Their combativeness and speed of movement is their protection. There is no need for them to see sideways or rearward. Man, being the most predatory of all animals, has not even the need to move his ears backwards to listen for attack from behind. Only the peaceful animals grow their eyes wide apart in the sides of their heads, and pivot their ears in every direction. When man—as usual embracing woman—grows his eyes in his temples, and wags his ears so as to listen to every argument all round him without wanting to hit back, then we can hope for universal peace. And not till then.

Meantime the empire with the greatest military force at its command is the least likely to be attacked, and has therefore the best guarantee of peace. It is also the best guarantee of peace—both military and economic—to any of the small nations which it may have swallowed on its way to greatness.

The Useless and Dangerous Small Nation.

A small nation is a danger to itself and to its bigger neighbours. Holland and Denmark are actually suffering more from the effects of the war in a good many ways than are England and France. Belgium, Servia, and Roumania to-day, Greece in a less degree, and probably Bulgaria to-morrow, demonstrate the fate of small nations when their big neighbours disagree.

Belgium as part of France, with French conscription in force, might well have staved off the first German thrust just as that thrust was held up on the French Eastern Frontier, and so might have saved not only

herself but Northern France as well. And, to be perfectly impartial in what is purely philosophic argument, Belgium as part of Germany would have been saved the worst horrors of war which she has suffered, and would merely have been somewhat discommoded by our ineffective blockade, as the rest of Germany has been.

Servia as part of Austria would have escaped invasion and annihilation, and would merely have contributed her men and her pigs to the common cause. As part of Turkey she would have been in the same boat. As part of an Italian Empire which embraced the whole Adriatic she would have been as adequately defended as the rest of Italy. And as part of a Balkan Empire under a strong Emperor she might have kept out of the war altogether.

Greece, also, as part of such a Balkan Empire might have remained at peace, instead of being a mere pathway for the warring Powers. As it is, Greece has suffered, in the same way that Belgium has suffered, simply through being in the way, and not because of any personal animosity. Incidentally, it is time that someone did bare justice to King Constantine.

If one considers his position fairly, one sees that he acted throughout, as a gentleman should, in what seemed to him the best interests of his adopted people. If he had joined us at the start, Greece would have been over-run by the Central Powers, just as Belgium and Servia and Montenegro and Roumania have been over-run. If he had joined the Central Powers, we should have blockaded Greece as we have blockaded Germany, and we should have hammered all his ports to pieces, because the Central Powers could not have supplied Zeebrugge-Tirpitz-type batteries to all the Greek ports as well. As it is, Greece has been saved the worst trials of war for three whole years, which, after all, is not bad going.

Even from our own point of view King Constantine has not done badly, because so long as Greece remained neutral, and so long as the Central Powers respected that neutrality, Greece prevented our Salonika Army from being outflanked, just as Switzerland prevents the French right from being outflanked. Now that our left has presumably joined hands with the Italians in Albania, Greek neutrality does not matter, but it certainly was useful in its time. What would happen to Greece now if the Allies took it into their heads to cut their losses in the Balkans and clear out from Salonika, as some people in Parliament have advocated, is another matter which does not concern us. Presumably M. Venizelos and his friends would have an uncomfortable time from the Turks and Bulgars, and from the Royalist party in Greece. Which only serves to emphasise the disadvantages of being a small nation.

The Solution of the Irish Question.

The pity is that some of our Irish friends cannot see that point of view and realise the benefit of being part of a big empire, with local self-government. I fear that, in default of being taught by an enemy, as Belgium and Servia have been taught, we shall have to teach them ourselves, by the old and provedly effective methods of Strafford and Cromwell.

After all, the naughty child which is spanked into a state of exhaustion and is then put peacefully to bed lives a far more healthy life than the child which is allowed to sit up late just because it kicks and screams, and is fed with sweets to keep it quiet, with ultimately ruinous results to its internal economy. And the former is far less trouble to the grown-ups in its vicinity.

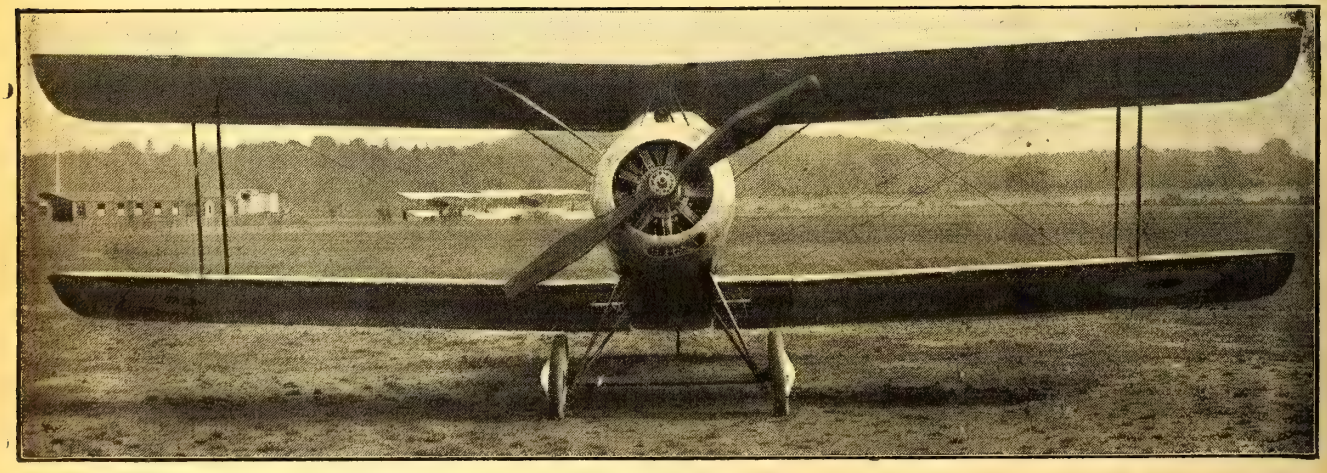
It is all very fine for the British Empire to pose as the protector of small nations, and no doubt it is a noble part to play. I merely state my personal views when I say that small nations are a danger to themselves and everyone else. Also, quite possibly a small nation may not be worth preserving in any case, no matter whether it costs much or little to save it.

Saving the Undesirables.

The problem is rather like that which all these good people shirk who are organising "Baby Weeks" and "Save the Children" crusades. They never stop to think whether the children ought to be saved in the interests of the Empire.

I am told that there is an infantile death-rate of 80 per cent. in the East End. These good people do not seem to see that the East End is merely Nature's lethal chamber for the undesirable. The wasters of the nation gravitate to the slums, where their race mercifully dies out. If that 80 per cent. death rate could be reduced by "baby-saving" to 20 per cent., we should merely be increasing the criminal and diseased population by that 60 per cent.

The well-educated, hard-working classes cannot afford large families, because the money they would need to educate a number of children is taxed out of them to pay politicians and to pander to the mob. Consequently, if you save the mob's children, you ultimately produce a population which is entirely mob. And you produce in the end precisely the same condition which caused the break-up of the Roman Empire, when the



Front View of the "one-and-a-half strut" Sopwith (1915-16 type) with Clergêt Engine. In its day one of the most startling performers in the world, and a machine which continued to do excellent service long after its legitimate life was over.

solid middle classes had been squeezed out of existence by taxation between the upstart rich and the mob which the plutocrats tried to bribe into quietude.

What would happen to the canine population if we allowed all the mongrel pups to live and stopped breeding thoroughbreds? That 80 per cent. death-rate arranged by Nature corresponds to the mongrel-pup death-rate arranged by dog-owners. It is well to remember that Nature in all her manifestations is more ruthless than any Hun, whether in vegetable life, bird life, or animal life, and man is only a species of animal. A high death-rate among undesirables is a biological necessity.

All of which may not appear to have much to do with aeronautics, though in fact it bears on the subject very directly, and is all part of the lessons of the past three years.

A Parallel Case.

For example, those who advocate that the Flying Services should be combined into one service separate from the Navy and Army may do well to consider whether they would not be creating a sort of "small nation" which would be a nuisance to the two senior services and a danger to itself. It would probably be a wiser course to create one single War Department which would control Land, Sea, and Air Forces alike, each branch being separate in organisation of supplies, but under one administrative and operative head. This, at least, would be following out Nature's law that small separate forces must be combined in order to produce one great effective force.

Democracies.

Time was when every little baron had his own army and fought his neighbours. Then dukes arose who combined groups of barons. Then kings combined groups of dukes. And then emperors combined groups of kings. To-day we record the fact—"celebrate" is the word used by some papers—that we have been at war for three years. In the three years we have endeavoured to prove that several so-called democracies with the resources of the whole world behind them can crush one solid empire, *vide* the excellent map published by the "Daily Mail" on Saturday last.

Doubtless the German Empire will be crushed in due course, and deservedly so, but the fact that it has stood up solidly for over three years to the assaults of so many nations with such an immensely superior population is the best possible argument in favour of an organised empire as against disorganised democracy.

The greatest danger to civilisation in the future is that free and unfettered democracy may get the upper hand. We in England call ourselves a democracy, but that is merely political cant. As a matter of fact, we are at present a bureaucracy tempered by demophobia. And government influenced by fear of the mob is only one degree better than government by the mob.

France also calls herself a democracy but is in fact an oligarchy, for her successive Governments ring the changes on a few prominent Ministers time after time. Probably an intelligent oligarchy is the third best form of government, after a patriotic aristocracy and a benevolent autocracy. Which, coupled with the wonderful staying power, the true patriotism, and the great ingenuity of the French people themselves, doubtless accounts for France being the nation with the finest record in this war for military energy, warlike skill, and patriotic self-sacrifice. No matter how the war may end, no matter how France may be weakened by war, the French will go down to history as the greatest people of this epoch.

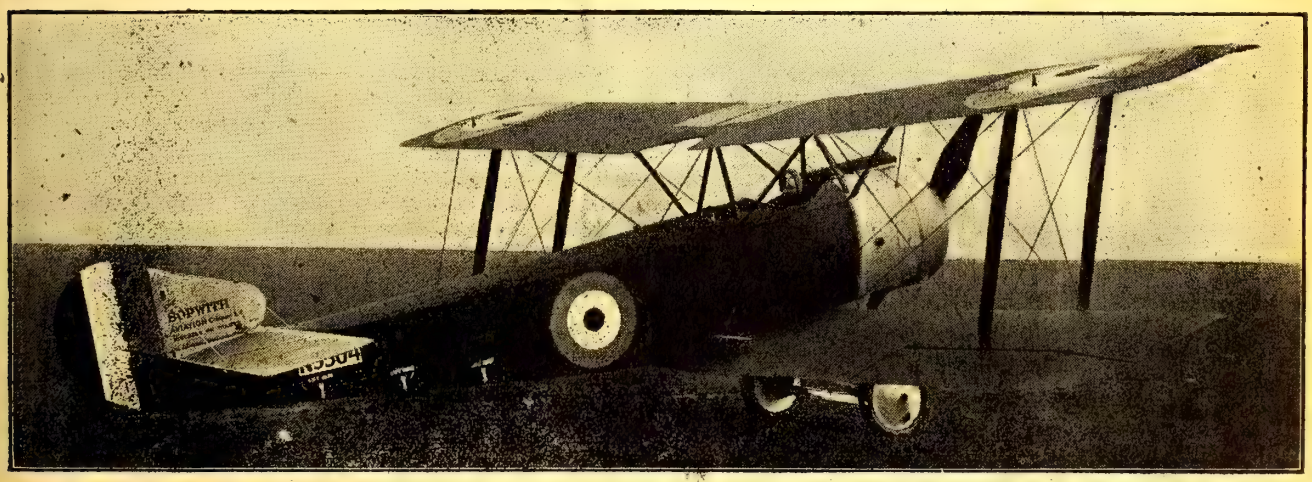
Mob Rule at Large.

If you desire to see democracy, mob rule, at its best and purest to-day, look at Russia. There you have government of the people by the people for the people in all its nakedness. It is hard to come by accurate news from Russia in these days, but gradually people are trickling back to more comfortable countries, and one hears a little of what is and has been going on. Some day certainly a new Carlyle will arise who will write the history of the Russian Revolution. I hope to live to read it, for apparently the French Revolution of 1790 and thereabouts was a mothers' meeting compared with the Russian effort. Russia is so much bigger than France, and the whole thing seems to have been done on a bigger scale.

In other ways the parallel is curious. The French Revolution also came in the middle of wars. The French Armies fell to pieces very similarly, and they were afflicted similarly with "commissaries" from the Revolutionary Government—of whichever party happened to be in power. The rising in La Vendée doubtless has or will have its parallel in Russia, possibly with other results.

A Slav Napoleon.

In fifteen years after the French Revolution, France under Napoleon the Great had conquered a Europe already weakened by continuous wars. But it was the French autocrat who conquered Europe, not the French democracy. History has a queer way of repeating itself,



The 1915-16 type Sopwith biplane, commonly known as the "one-and-a-half strutter." The reason for the name is that there is one pair of struts on each side of the fuselage, and a pair of half struts from the spars to the fuselage in the centre. The example shown above is arranged as a single-seater with a machine-gun firing through the propeller.

and it will be interesting to see whether or when a Slav Napoleon arises.

The Slav is, and always has been, even less capable of self-government than other races. An Ivan the Terrible or a Peter the Great had an easier job than a Cæsar, an Alexander, a Frederick, or a Bonaparte, for he had a less organised and educated people to use as his raw material. Being less educated, they were easier to drive.

A Still Useful Ally.

The Slav peoples may perhaps be got under control in time to finish this war in favour of the Allies. If the Russian armies retreat far enough into their own country, the Russian people may be driven to defend themselves. At any rate, so long as any Russian army exists, it will occupy a vast number of German and Austrian troops, and so will relieve the pressure on the French and Italian fronts. Even anarchistic chaos in Russia will prevent peace with Germany, and that will be so much to the good, for peace between Russia and Germany would mean the revictualling of Germany from the vast supplies of food in Russia which at present cannot be exported anywhither.

But even at best we must not reckon on Russia as an assistance in any great offensive, and so we must be prepared to see the war through on our own account, at any rate till next year. From which we may learn the useful lesson that any nation entering into a war must be prepared to fight to a finish on its own resources, irrespective of its allies, for the best of allies may collapse from internal causes, or be beaten by sheer fighting power.

Aerial Democracy.

All of which, again, has its parallel in the smaller world of aeronautics. To-day our aircraft supplies are under a species of democratic government in the Air Board. Every department, almost every individual official, issues its or his orders in the name of the Board, and the result has been a state of chaos not dissimilar from that prevailing in Russia.

It is said that only a few days ago one of the Board's few really capable technical men, one who has done splendid work during his short period in office, handed in his resignation owing to his plans being held up by reactionaries. Fortunately his resignation was refused, and his plans were confirmed by those still in power, but such incidents would never be allowed to arise under a proper system of organisation in which one strong man with full knowledge of his subject had control of the whole business. Nowhere is a benevolent and intelligent autocracy more necessary than in a munition supply department and nowhere is mob rule or amateur Socialism more dangerous.

The Succession of Hindrances.

In many articles in the past three years I have pointed out the harm done to output, originality of design, and progress generally by too much official control. At the beginning of the war we suffered heavily from the hampering influence of the Royal Aircraft Factory on British engine and aeroplane designs. Later we suffered from the mistakes made by the R.N.A.S. design department. Later again we suffered from the delays caused by the Aeronautical Inspection Department, with its impossible limits and qualifications. Later still we have been hampered by the control of supplies of material and machinery.

To-day new troubles are arising from interference with the buying of material, and the endeavour to centralise all buying in the hands of officials devoid of business experience or ability. Each evil in turn has reduced our output of aeroplanes, and each trouble should have been a lesson to us for the future.

In every case the underlying cause of trouble has been official refusal to recognise the fact that individual enterprise can always beat official performances, especially when the officials concerned are only in office because they have not enough ability to be worth more money in commercial employment. If Lord Cowdray will once recognise this fact, and will give experienced manufacturers a free hand to attain their maximum output, he will do a great good to the Flying Services, and will justify the exalted position which he now holds.

The Bright Spot.

The one really bright spot in the three years of war is the magnificent spirit maintained by the active-service aviators of both Services.

It has been alleged, by those who are to blame for what is wrong with our supplies, that agitation for improvements lowers the *moral* of those on active service because it decreases their confidence in the High Command. Such an argument may sound clever enough, but it is fallacious, and, moreover, it is an insult to the men on active service.

They do their work gallantly with such material as is given to them, and hope for something better, just as our men in the trenches in Flanders in the early days of the war hung on grimly without artillery, waiting for guns which eventually arrived after much agitation. The R.N.A.S. pilots have had splendid confidence in their immediate commanding officers all over the world, and the R.F.C. people likewise have hardly ever grumbled about their senior officers in the field.

In particular, nothing could be finer than the personal devotion of the R.F.C. in France to their G.O.C., and only such confidence in and devotion to their leader could have induced the pilots, observers, and gunners to carry on their work as they have done at periods when they have been utterly outclassed and outnumbered. The spirit infused by General Trenchard into the R.F.C. is worthy of the highest traditions of the British Army.

The Agitators.

It is, however, certain that the staying power of our aviators has been materially supported by the knowledge that there are always people at home whose one aim in life is to force officialdom to produce the best possible aeroplanes for both Flying Services. These people who work for improvement are of all sorts. Some work quietly by means of personal influence in high places. Some cry aloud on public platforms. Some speak gently in Parliament. Some write long or short, violent or subdued, articles in public prints. Some argue civilly in learned societies. Some indulge in personal abuse in clubs and other places where aviators congregate. Some pull strings. Some use sticks. All are lumped together by defaulting officialdom as agitators. All, in their degrees, are necessary evils, and all have served a useful purpose in producing more and better aeroplanes, either by scaring the taxpayer or by perturbing the serenity of self-complacent and inefficient officials.

So among the lessons of the last three years is the fact that without agitation we should be much worse off than we are, and that until a reasonable approach to perfection is achieved agitation is necessary and will continue.—C. G. G.

THE PARLIAMENTARY AIR COMMITTEE.

At a meeting of the Parliamentary Air Committee on August 2nd, presided over by Mr. Joynson-Hicks, a number of resolutions were passed for transmission to the Prime Minister and the President of the Air Board. These dwell on the necessity for a great increase in both the personnel of the Air Service and the production of aircraft, and press for the unification of the Navy and Army Services under an Air Administrator, with adequate powers and full responsibility.

NAVAL AERONAUTICS AS SEEN BY AN AMERICAN.

BY "BERKELEY."

To the United States of America the honour belongs of having through the perseverance and skill of two of its citizens produced the first aeroplane to fly with sustained success. Through many generations a number of the more intellectual of those who inhabited the European continent whence sprang the malcontents who gave to Northern America a new chapter of history had dreamed of a day when human flight controlled and directed by the human brain would be possible. Theory and experiment alternated one with the other, but to neither came the joys of attainment.

From Leonardo da Vinci to Sir George Cayley, from Sir George Cayley to M. Ader, the science progressed but little, and the secret of flight partially understood through all this time was never subjected to practical revelation. Fortune, who had frowned on the graceful minds of the princes of civilisation, gave her truest help in this matter to an American engineer unknown to earlier fame or history.

America's Lost Opportunity.

So great is the reputation of nations successful in commerce that it might be imagined that the United States would have accepted the opportunity given by the favours of Fortune, and with continuous energy and skill would have led the way in the new science. In truth, commercial success breeds scepticism as to the use of all else in the world. Consequently to-day, not half a generation since the first flights were made in America, there are few nations less advanced in matters of aeronautics than is the newer Europe beyond the seas.

There were few incentives towards the production and development of aircraft. There was no immediate use for aeroplanes in commerce, and there existed no neighbouring naval or military rivalry strong enough to make necessary the formation of a large air service. Sport alone could do little. The aeroplanes of the day could satisfy all that the amateur required. And so initiative left the designers and the constructors, and another great opportunity was lost.

A Praiseworthy Effort.

Yet, despite this lack of enthusiasm and of appreciation, the United States was the first nation to give any degree of serious attention to naval aeronautics. Early in 1911 Congress set aside a sum of £5,000 for the formation of an aerial arm in the naval service. A station was organised near Annapolis, Maryland, and three naval officers were attached for duty. No other country had as yet even thought of the expenditure of any money at all on the actual provision of aeroplanes for their fleets.

It is therefore of interest to read a recently published work by a Mr. Henry Woodhouse, of the United States, entitled "Textbook of Naval Aeronautics," and dealing generally and lightly with the subject. Particular attention is paid to a minute description of the duties and habits of the Air Service of the U.S. Navy.

It is an ambitious work of some 288 quarto pages decorated by 300 illustrations. Descriptions of deeds performed during the present war alternate with theories as to the future development of the naval aeroplane. The book begins with a chapter on aerial strategy and tactics, and works backwards to chapters in which appear voluminous naval orders as to the mode of training and manner of life in the flying section of the U.S. Navy.

Obvious Limitations.

It is a description of the life and the duties of United States naval aviators rather than a textbook from which the youthful aviator might learn such things as are proper to the work he has chosen. For instance, "Aeroplane Guns and Aeroplane Gunnery" is dealt with in a chapter of less than 350 words, in which no description of any type of gun is given, and the Hotchkiss, often used by the French, is not even mentioned.

Observation for ships' guns has a chapter to itself, three-quarters of which is taken up by an extract from Admiral King-Hall's dispatch after the destruction of S.M.S. "Königsberg" in the Rufigi River, and no exposition is given of the attendant difficulties in this part of an aviator's duties.

In a similarly brief manner the author deals with such matters as radio-telegraphy, aerial photography, and bomb-dropping. In each case he emphasises the importance of the subject by an arbitrary statement, and devotes the remainder of the chapter to short anecdotes of incidents during the present war.

An Example of Ineptitude.

He talks of "night flying" in Chapter XXII. There is no part of military aviation which exceeds in practical importance this side of life, in either a naval or military air service, and yet Mr. Woodhouse gives no indication as to the peculiar difficulties of flying by night over water. He devotes his chapter to an account of Mr. Lawrence Sperry making a flight from Moriches to Amityville during the night of September 1st, 1916. This gentleman, it would appear, has designed a lighting set for use in aeroplanes by night.

The darkness is riven by a brilliant pathway of light from three 40,000 candle-power lamps which are attached charmingly to either the upper or lower plane, whichever may give greater personal pleasure to the aviator. He controls their movement over an extensive arc by means of a "knob fastened within easy reach of the pilot." That he does not describe the method by which the knob controls these lights is a sufficient indication of the manner in which this "textbook" is compiled.

One of the Useful Parts.

The only real value of the book lies in the information given as to the organisation of the aeronautical section of the U.S. Navy. Everything that can be learnt as to the formation or method of operation of any foreign air service is of value to those whose life is spent in flying in the King's Service. By the mistakes of others one learns almost as much as by one's own errors.

From the spring of 1911, when naval aeronautics began their history in the United States, the U.S. Naval Air Service remained at Annapolis until October, 1913, when an additional station was authorised at Pensacola, Florida. The three aeroplanes of the earlier station were replaced by many more, and the use of dirigibles and kite balloons was authorised. The U.S.S. "Mississippi" was extracted from her place of peaceful retirement in the Reserve Fleet for service as seaplane mother ship at Pensacola.

The Universal Brotherhood of Officialdom.

The committee responsible for the recommendations on which these extensions were based further submitted that an office of naval aeronautics be formed, "to be under the charge of a director of naval aeronautics with the rank of captain, if practicable, who shall co-ordinate the work of the office for the Secretary of the Navy in

conformity with the departmental organisation, and in co-operation with the necessary assistants representing the bureaus." Thus pleasantly is set forth the genesis of all things official!

The nucleus service formed in so tentative a manner was speedily put to a practical test. Mexico, usually closely occupied by the vivid complications of internal politics, for once turned its attention to the stranger within its gates, and was unpleasantly brusque with some citizens of the United States, and it was considered necessary to make a naval demonstration at Vera Cruz.

With the naval force sent to Vera Cruz in April, 1914, was the "Mississippi," with an aeroplane section on board. The Secretary of the Navy—he who suppressed intoxicating drinks in the national fleet—in a letter written to Mr. Woodhouse proudly states that within five minutes of the seaplane carrier having dropped anchor an aeroplane was flying over the Mexican coast. Then and for weeks afterwards a daily patrol of the coast was carried out, and valuable experience was gained. Effective opposition was lacking, and the lesson was therefore incomplete. But the present war will fill the gap in practical knowledge.

A Fair Arrangement.

All officers of the Navy and Marine Corps while "detailed for duty involving actual flying in aircraft," and qualified as naval aviators, receive the pay and allowances of their rank plus an addition of 50 per cent. This would appear to be a fairer method than that prevailing in the British Navy. The discrepancy in pay between officers performing the routine duties of the navy and those who are trained as aviators is less noticeable and is less unfair. A further regulation ordains that only 48 officers and 96 men of the Navy and 12 officers and 24 men of the Marine Corps may receive this extra pay at any one time Nor is any officer above the rank of lieutenant-commander or major allowed to draw such additional pay.

These regulations may have been modified in the Naval Bill of 1916, but Mr. Woodhouse does not give any information on the point.

Quaint Methods.

His, the author's, mode of describing the manners and customs of the Naval Air Service of his country is to print on many pages of his six-dollar work the detailed orders issued at many American air stations, including even such paragraphs as detail the occasions on which bathing dress may be worn on duty. He includes a two-page diagram of an ideal naval air station which resembles somewhat closely the drawings in a preliminary prospectus of an English garden suburb.

Many letters from cleverly initialled celebrities of the United States, and addressed to the author, are printed in full, even though their purport may be the conveyance of official thanks for some previous act of letter-writing.

The Pretty Pictures.

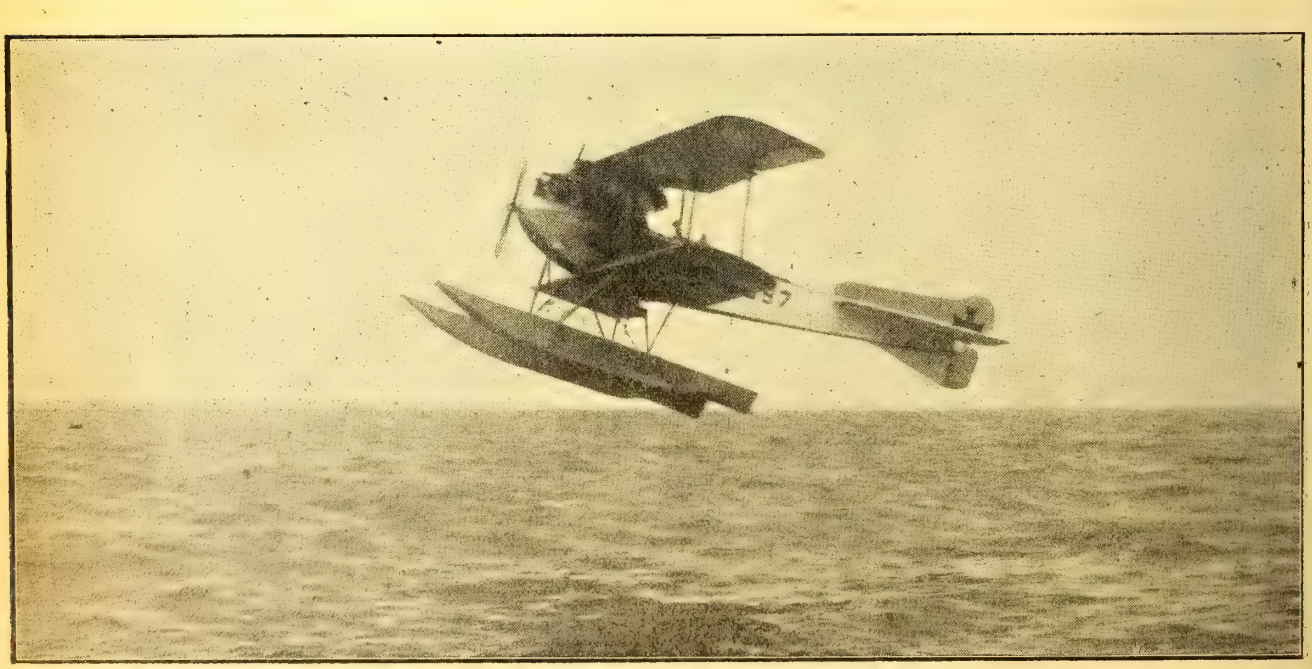
The book is heavily illustrated with photographs of flying in America and in the war area. Such photographs as deal with flying during the war are almost invariably inaccurately described. For instance, a photograph of the Castle of Tenedos, given on page 122, is described as one of Gallipoli taken from a height of 2,600 feet. Any aviator who would endeavour to photograph the latter town from so low an altitude during this present war would thoroughly deserve his consequent obituary notice.

A photograph of a cinema operator standing in a military B.E.2c is described as that of "a British naval aviator starting out to film a military observation."

But the mistakes are innumerable. The book, taken as fiction suitable for the young, has a certain degree of usefulness. As a serious contribution to the science of naval aeronautics it is entirely valueless.

Addendum.

[To which one may add that the paper is of the glossiest and the printing of the best, so that if one cannot compliment the author in any marked degree, it is, at any rate, possible to recommend the paper-maker and printer to any future American author who may contemplate producing a serious book on Naval or Military aeronautics. One gathers, however, from those expert in such matters, that these glossy papers, vulgarly and therefore erroneously known as "art papers," are so composed chemically as to disintegrate into fine dust within forty years. Perhaps, therefore, the serious historian will do well to choose paper of another species. For the work under review the forty-year limit seems excessive. —C. G. G.]



HEALTHY ZOOM.—A German seaplane just after leaving the water performing the operation colloquially known as "zooming," that is to say, carrying on upwards by its own momentum at an angle in excess of its possible climbing angle.

In the Defence of the Realm.

BY GEOFFREY DE HOLDEN-STONE.

Ten minutes to twelve. Of that particular midnight, if you please, which the new calendar calls the 24th Pluviose, Year the Second of the Republic One and Indivisible.

For one person at least, the last act is played. For a moment ago, in the presence of a numerous and variously distinguished audience, dumb with a common anxiety to know the full dénouement, best or worst, the Tribunal pronounced sentence.

Sentence of death, of course. When all are equal by law, some few thousand, to say nothing of one, can easily be spared.

So the actors, audience, supernumeraries and stage hands may each forthwith doff the mask of impassibility or wipe away a last tear and be done with it. Mechanically the court-assistant snuffs the candles. Here in this hall, which but a moment ago echoed with the clash of grounded arms, with high-flown eloquence, with curses and sobs, remains only a great silence. From without come the usual noises of a city not yet asleep: dulled certainly by the sodden fog, but sufficient, nevertheless, to return everyone's mind to his daily preoccupations, and—to forgetfulness. To-morrow; well, who has seen To-morrow?

To-night's play is done with, at any rate.

Therefore along chilly passages, by stairways damp with filth, under arches sweating with the fog, goes Claudin Valentin Millin-Labrosse, ex-captain of artillery of La Fère, led between two warders to the lower hall of registration—all other places of reception being just now inconveniently full—to await the dawn and the executioner. For the crime—as no doubt you heard, half an hour ago—of being concerned in scientific investigations; without doubt conceived against the safety of the Republic. And thus to pass the rest of the night of this 24th Pluviose, in the Second Year of the Republic that is one and indivisible.

For the decision of this Tribunal, where Fouquier-Tinville, prosecutor or provocateur-in-chief, is the invariable plaintiff, though there is a new defendant every hour or so, has prescribed the execution of the condemned within the next twenty-four hours after sentence. But Sansom is a busy man in these days: so as to save time and make sure, the custom now is to pass the condemned direct from the dock into his hands, unless the sentence happens to have been passed at night; in which case, of course, everyone concerned may as well wait for daylight. The Republic one and indivisible will be no less safe.

Thus Du Barri, the incomparable, condemned by candle light, had all the hours of the alone-merciful night, to weep and agonise in. That also will be the privilege of Claude Valentin Millin-Labrosse. . . .

But it seems that there is room for such a special prisoner elsewhere, after all. Behold him then, presently, in a cell at the Conciergerie, for the moment the solitary successor of so many others in that sinister place. And he is not wholly without material comforts. There is a pallet-bed of sorts, some brackish water at the bottom of a pitcher: a little straw—not very clean, it is true—on the tiles of this underground cell: and after all, some little fresh air can get beneath that big studded door. Whereas there might be none of these things somewhere else. As, for instance, in one's coffin.

Now that we are all at our leisure, to look at him, this Millin-Labrosse, soldier, scientist, and—it seems—conspirator against the liberty of the people. Only a little, rather plump man, prematurely bald, with a long moustache falling upon a sparse beard. Clothes, worn and shabby. Complexion, once ruddy with the wholesome life of camps no doubt: but now pale from months of preventive detention. Really he might be any one of a thousand. Precisely as befits a time when all men are equal, of universal brotherhood, and free to enjoy the absolute liberty, we see around us . . . So by the uncertain light of the miserable lamp that relieves the darkness of the cell, the condemned hastens to a little table, in the drawer of which he has managed to hide a little paper and a drop of ink; goes on his knees before it, and begins to write.

Now the letter of a living man who is going to be a dead one in five or six hours can hardly fail to be interesting. What thoughts then is that squeaking quill setting down? To whom are those last farewells going, supposing that some compassionate soul can be found willing to transmit them? It is already two o'clock in the morning; and everyone asleep in this lugubrious abode of equal and fraternal liberty, of which the blind river is licking the bastions, twelve feet thick. M. le capitaine C. V. Millin-Labrosse must pardon us, in the circumstances, if we look over his shoulder. . . .

Actually he is writing to Fouquier-Tinville! A last protest, a final appeal, perhaps? Nothing of the kind. Millin-Labrosse is a soldier still, and so accepts his fate as it may befall, past even the sentiment of resignation. So he merely writes.

"*However imprudent . . . I did not expect to be treated as rigorously as I have been by your tribunal of the section of Equality. But of this I say nothing.*" Here it occurs to him that he has dated his letter in the customary manner, thus, "Conciergerie, Hall of the Dead," so he stops writing for a moment, blinded by helpless tears. Then little by little his face lights up and the colour burns feverishly on his thin cheek-bones, with the ardour of his theme, that makes him forget the imminent end of all things. So repeating "*Of this I say nothing,*" he continues.

"*I will remark only that I am leaving behind me the model in cardboard of an aërostat which possesses the advantage of being steerable. I should therefore desire above all things to give to the Revolutionary Committee of my section, or even to two of its members, the explanation of the theory on which it has been built. Less than two hours would be enough for this purpose, and I should die no less within the twenty-four hours as ordained. There, citizen-impeacher, that is all I take the liberty to propose to you. I am resigned, I shall die resigned; I do not wish in the least to prolong my life uselessly, but I do maintain that this will serve as a useful memorial of me when this time of wrath has passed. . . .*

P.S.—The Citizen Harny knew of my aërostat, and I now trust it to his knowledge, although he did lay the plaint concerning myself. I have no more paper. . . ."

So having written his letter, and signed it, presently he persuades the guardian of liberty—who appears to be a warder—to have it taken to the office of Fouquier-Tinville; who as the chief official defender of the Republic—by wholesale impeachment of her possible enemies—naturally must be housed in the most sumptuous building that can be found. No other than the Louvre hard by. His answer cannot be long coming. So, calmly enough, the ex-captain of artillery waits. . . .

Comes the dawn, sullen and wan. Slowly the abode of liberty, fraternity and equality awakes. Strange sounds penetrate it and grow louder. Harsh voices clash, die away, and repeat. Then the studded door opens, admitting Sansom and his assistants, who approach the condemned man. The Citizen Fouquier-Tinville has evidently forgotten to reply. Or perhaps he thinks that so slight a matter does not matter. No less will the Republic remain one and indivisible. At any rate, while he remains with unlimited police-power to defend its unity and indivisibility of politics and purse against all innovators. What matters a mere Frenchman or two, more or less, or ten thousand such, as compared with that ideal? Certainly not any Claudin Valentin Millin-Labrosse. For whom, therefore, in half an hour, nothing matters any more in this world.

But for France, and her people, what follows?

To be led, within another ten years, by her Man of Destiny, to find her soul in the wilderness of war. In years more of marchings and counter-marchings over the breadth of a continent, to make that soul great in discipline, great in conquest, greater in suffering, and greatest of all in defeat. And then for some forty more years to rest in untroubled self-possession.

Then for a while to steep herself and waste her strength in the depths of an utter materialism, lit as it were by a corpse-light of dead empire. And then suddenly to be called in her weakness to fight for her very life; yet to be most betrayed by those who should most have aided her against the new-risen spoiler of Europe. . . . Thus goes the lantern-show of France for a hundred years.

Yet how, in that day of her trial and agony, might not the wasted genius of this one of her sons, slain in her delirium, have saved her alive!

But—twenty years ago is all too late for a Hector Fleischmann to discover that letter long-buried in the National Archives. Too late for him to write: "Let modern science, still vanquished before the solution of the problem found by him who died beneath the guillotine of Fluviôse, Year Second, turn to the charnel-house of the Madeleine, choked with dead men's bones, and ask him for it. For the man whose last night of life was haunted with anxiety that his invention should be preserved for his country's need, who dreamed of a day when blind fury should no more prevail, lies there."

Too late. It is ever too late, when a people befooled by eloquence, entrusts its destinies to the rule of politicians and placemen.

For the nature of peoples, the working of destiny, and the rascality of politicians are three things that alter not with time nor place.

The Rue du Louvre and the Place de la Concorde are essentially the same as Whitehall and Northumberland Avenue. A century and a quarter has made no difference to the patient credulity of a people, its honourable capacity for being duped through its highest aspirations. And the trick of the politicians, after having betrayed the liberty and safety of the people, to

bind them helpless in the name of the defence of the realm is exactly the same. As good as new, apparently. As potent for evil. But as it invariably precedes revolution, in thought if not in action, there is always hope that the nation will suddenly defend itself and its realities of right and liberty against the cloudy abstractions behind which hide—the politicians.

To-day we have no Fouquier-Tinville, though there is no lack of patriotic genius. We have, indeed, no man so snugly and individually responsible. Instead, we have Committees and Departments even more deadly than he to individual effort. And in three years we have suffered the creation of the most inept and dangerous collection of bureaucrats that ever existed.

COMPARATIVE LOSSES.

From the "Times" of August 7th :—

With the warning that exact details up to the end of February, 1915, and for July, 1917, are not yet forthcoming, so that the figures for these periods are not "absolutely trustworthy," the "Berliner Tageblatt" gives the following statement of enemy and German aeroplanes shot down during the three years of the war :—

	German.	Enemy.
1914	—	9
1915	91	131
1916	221	784
1917 (to end of July)	370	1,374

From August 1st, 1914, to July 31st, 1915, 72 enemy aeroplanes were shot down, of which 39 fell into German hands; from August 1st, 1915, to July 31st, 1916, 455 enemy aeroplanes were shot down, of which 267 fell into German hands; from August 1st, 1916, to July 31st, 1917, "about" 1,771 enemy aeroplanes were shot down, of which 776 fell into German hands.

In 1915 two enemy captive balloons, so far as is known, were shot down; in 1916, 42; in 1917 to August 1st, 142. Three enemy airships were also shot down.

Total aircraft shot down from August 1st, 1914, to August 1st, 1917, about 2,298 enemy and 682 German aeroplanes, 186 enemy captive balloons, and three airships.

The "Times" remarks :—

Official figures are not accessible for the purpose of checking the claims made by the Berlin journal in respect of Allied aeroplanes, but it is possible to test, both from official and unofficial sources, the accuracy of the figures given of the German losses for at least some portion of the three years. For instance, the "Matin," whose authority is at least as high on the one side as that of the "Berliner Tageblatt" is on the other, stated on January 1st, 1917, that the French brought down 450 German machines in 1916 and the British 250. This figure of 700 compares with the German admission of 221. There is confirmation of this unofficial estimate in the table compiled from the statements in the official communiqués of British and French Headquarters which appeared in the "Times" of December 5th, 1916, and which showed that for the six months June to November in that year 666 German machines were brought, shot or driven down by the Allies. If we take the year 1917 as it is calculated by the "Tageblatt"—August 1st, 1916, to July 31st, 1917—the official British and French figures show that 2,076 German machines were sent down—1,325 by the British, 751 by the French. It is not pretended that all these were destroyed, but if we take, merely for May, June, and July, those which were officially stated to have crashed, to have been destroyed, brought down in flames, shot down by gunfire, or captured, we get, instead of the "Tageblatt's" figure of 370 for the whole year, 523 for three months.

[The probability is that the Germans admit only absolute *losses*, and if a machine crashes behind its own lines it is obviously not lost, even if its crew have "gone before." The figures may thus be compared with the British admissions of machines which "fail to return," or are merely "missing."—Ed.]

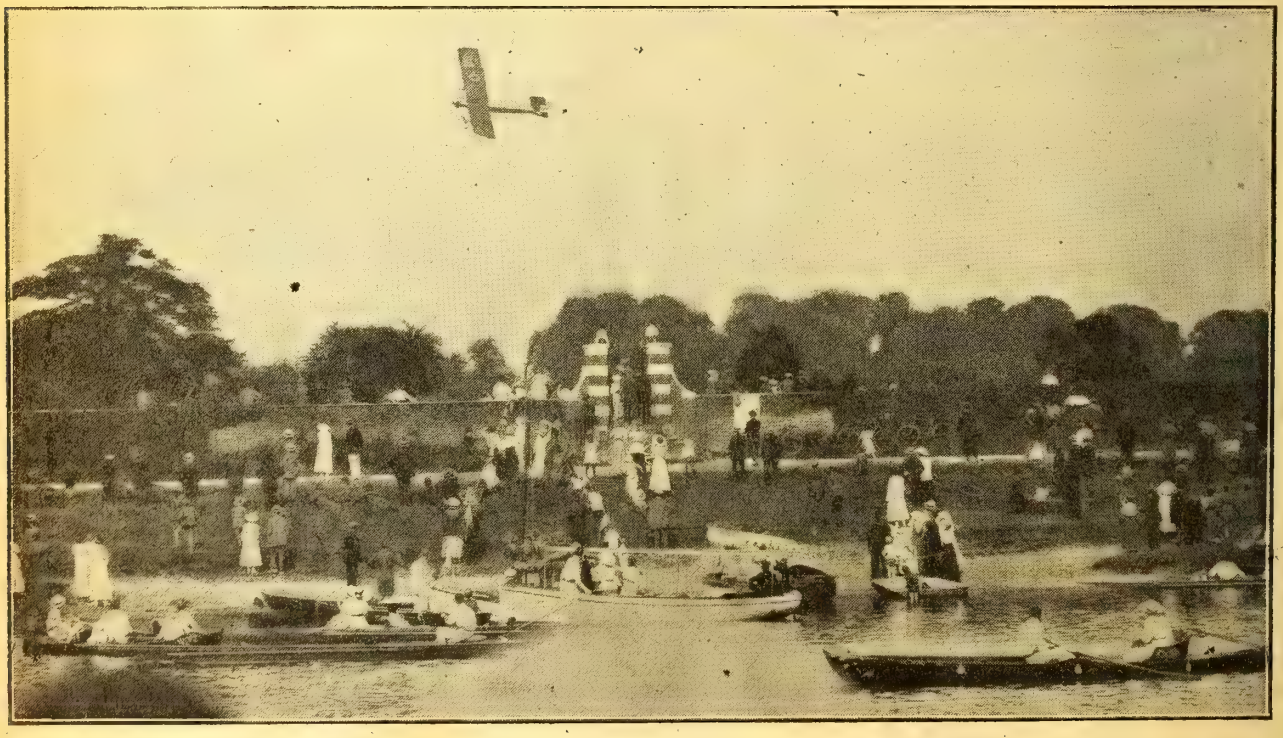
SERVICE STUNTING.

The following paragraphs from the "Times" of August 7th draw attention to a matter to which the High Commands of the Flying Services might well give attention :—

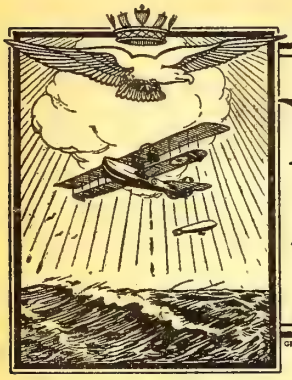
About the middle of the afternoon (Monday, August 6th) the crowd was given a thrilling display of airmanship by three British aeroplanes which came over the fair ground at Hampstead and spent half an hour in performing feats for the benefit of the earth-bound. They "looped the loop"; they took "nose-spins"; and they did a variety of other tricks which were not always recognised at first as the voluntary evolutions of daring men. But the most sensational feature of the exhibition was the amazingly low altitude at which they flew backward and forward.

A machine would swoop down until it seemed to miss the tree-tops only by a few feet and then with a great roar and at a terrific speed it would tear through the air just over the heads of the people—so low, in fact, that every spar and wire could be plainly seen, and one could even detect a small rent in one of the planes. It was all very novel and exciting, but there were some in the crowd who, while they admired the skill and pluck of the aviators, were inclined to doubt the wisdom of these perilous swoops over wooded and hilly ground swarming with people.

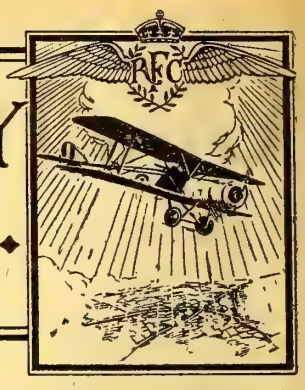
[There has been far too much of this silly stunting for a long time past. Aviators are trained and aeroplanes are built at considerable expense in order to be smashed up on active service. The young fools who perform in the manner shown in the picture below merely incur the contempt of experienced people concerned with aviation. As General Henderson was so keen on preventing R.F.C. officers from encouraging the "trade" by flying in public under proper sporting rules before the war, perhaps he will consider preventing his officers from performing like street mountebanks during the war.—C. G. G.]



HOW WE WASTE AIRCRAFT.—A snap-shot during the Thames-Ditton Regatta, showing England in War Time, with an aviator doing silly stunts over Hampton Court Palace, wasting petrol and endangering the machine, which is the nation's property. It would be interesting to know how many machines have crashed through their pilots showing off over crowds.



NAVAL and MILITARY AERONAUTICS



FROM THE "LONDON GAZETTE."

Admiralty, July 25th.

R.M.L.I.—Maj. T. O. H. Lees is secd. for service with R.F.C., Aug. 1st.

War Office, July 31st.

REGULAR FORCES.—Wt. and N.C.O's. to be temp. Sec. Lts. (on prob.):—

Memoranda.—Wt. and N.C.O's. to be temp. Sec. Lts. (on prob.) for duty with the R.F.C.:—Sgt. H. R. Griffin, from R.F.C., June 7th. Co. Sgt.-Maj. L. M. Nava, from H.A.C., T.F., June 11th.

Establishments. — R.F.C. — Mil. Wing. — Sqdn. Comdr.—(Whilst specially empld.)—Lt. (temp. Capt.) A. C. Maund, Can. Local Forces, a Flt. Comdr., and to be temp. Maj. whilst so empld., June 1st.

War Office, August 1st.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing.—Flt. Comdr.—Capt. R. B. Bourdillon, Spec. Res., from a Flying Officer, July 18th.

Park Comdr.—Sec. Lt. (temp. Capt.) T. G. Clarson, Spec. Res., from an Equipment Officer, 1st Cl., and to be temp. Maj. whilst so empld., July 1st.

War Office, August 2nd.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing.—Sqdn. Comdr.—Lt. (temp. Capt.) L. T. N. Gould, M.C., R.A., from a Flt. Comdr., and to be temp. Maj. whilst so empld., July 19th.

Flt. Comdr.—The appointment of Lt. (temp. Capt.) L. J. Bayly, R.A., notified in the "Gazette" of Feb. 6th, is antedated to Nov. 4th, 1916.

Park Comdr.—Capt. A. L. C. Neame, R.E., from a D.A.D. at the War Office, and to be temp. Maj. whilst so empld., July 9th.

War Office, August 3rd.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing—Wing. Comdr.—Capt. F. A. Wanklyn, M.C., R.A., from a D.A.D. at the War Office, and to be temp. Lt.-Col. whilst so empld., July 4th.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld.:—Sec. Lt. G. B. Pratt, R.A., July 6th. Sec. Lt. (temp. Lt.) C. R. Robbins, M.C., R.A., July 19th. Sec. Lt. (temp. Lt.) C. B. Riddle, Durh. L.I., T.F., July 20th.

Schools of Instrn.—Balloon School of Instrn.—Comdt.—Graded as a Sqdn. Comdr.:—Sec. Lt. (temp. Capt.) J. W. Jardine, Spec. Res., from a Balloon Co. Comdr. (graded as a Flt. Comdr.) and to be temp. Maj. whilst so empld., vice Capt. (temp. Maj.) D. Rainsford-Hannay, Ind. Inf., who continues to hold the appt. of Balloon Co. Comdr. (graded as a Sqdn. Comdr.), May 11th.

Machine-gun Corps.—Flt. Lt. A. O. French-Brewster, from R.N.A.S., to be temp. Capt., July 25th.

War Office, Aug. 4th.

REGULAR FORCES. — Establishments. — R.F.C. — Mil. Wing.—Sqdn. Comdr.—Lt. (temp. Capt.) W. J. C. Kennedy-Cochran-Patrick, M.C., Rif. Brig., from a Flt. Comdr., and to be temp. Maj. whilst so empld., July 22nd.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld.:—Sec. Lt. (temp. Lt.) A. W. F. Glenny, A.S.C., May 25th. Temp. Sec. Lt. D. P. Collis, Gen. List, July 22nd. Lt. C. E. Blayney, Spec Res., July 23rd.

Balloon Co. Comdr. (graded as a Flt. Comdr.).—Capt. (temp. Maj.) J. H. Davies, Ches. R., T.F., from a Balloon Officer, July 23rd.

Adjt.—Capt. W. H. L. O'Neill, Ind. Inf., from a Flying Officer (Observer), June 18th.

Park Comdr.—Capt. C. E. Gardner, Glouc. R., T.F., from an Equipt. Officer, 1st Cl., and to be temp. Maj. whilst so empld., July 27th.

Equipt. Officers, 1st Cl.—From the 2nd Cl., and to be temp. Capts. whilst so empld.:—Lt. W. W. Stenning, Spec. Res., July 21st. Lt. E. S. Bramham, Spec. Res., July 27th.

Royal Regt. of Artillery.—R.G.A.—The undermentioned Maj. to be actg. Lt.-Col.:—Bt. Lt.-Col. C. C. Marindin, April 9th, 1917.

War Office, Aug. 7th.

The names of the following have been brought to the notice of the Secretary of State for War for valuable services rendered in connection with the war:—

Fletcher, Qrmr. and Hon. Lt. (temp. Lt.-Col.) A., M.C., R.F.C.
Pryce, Qrmr. and Hon. Lt. (temp. Maj.) W. J. D., R.F.C.

FROM THE COURT CIRCULAR.

The King has forwarded to Alderman Albert Ball, of Nottingham, father of the late Capt. Albert Ball, V.C., R.F.C., the following letter:—

Buckingham Palace, July 28th.

It is a matter of sincere regret to me that the death of Lieutenant (Temporary Captain) Albert Ball, D.S.O., M.C., late 7th Battalion, Notts and Derbyshire Regiment, and the Royal Flying Corps, deprived me of the pride of personally conferring upon him the Victoria Cross, the greatest of all rewards for valour and devotion to duty.

George R.I.

Alderman Ball received his son's decoration from the King at a recent investiture.

* * *

Buckingham Palace, August 3rd.

The following Officers had the honour of being received by the King, when His Majesty conferred decorations as follows:—

The Distinguished Service Cross and Bar.

Flt. Comdr. Charles Scott, R.N.A.S.

The Military Cross.

Capt. Douglas Gawler, Royal Scots and R.F.C.
Capt. Robert Holme, Somerset Light Infantry and R.F.C.
Capt. Robert Saundby, Royal Warwickshire Regt. and R.F.C.
Lt. Thomas McConkey, Canadian Infantry, attd. R.F.C.
Lt. William Meggitt, Wlesh Regt. and R.F.C.
Lt. Arnold Phillips, Royal Fusiliers and R.F.C.
Lt. Lionel Beevor-Potts, South Wales Borderers and R.F.C.

NAVAL.

The following appointments have been made ni the Royal Naval Air Service:—

July 31st.—Eng. Lt.-Comdr.—A. Leamon-Berry, graded as Proby. Sqdn. Comdr., seny. July 21st.

Lts. (R.N.V.R., tempy.).—B. T. Hamilton, W. F. Vernon, S. T. Baker, W. E. Plaister, J. R. Erskine-Murray, all promoted to Lt.-Comdr. (temp.), seny. April 1st. W. H. Yeatman-Biggs, promoted to Lt.-Comdr. (temp.), seny. July 28th.

Sub-Lt. R.N.V.R. (temp.).—W. H. Bedford, promoted to Lt. (temp.), seny. July 28th.

The following temp. commns., R.N.V.R. have been granted, seny. as stated:—Lts.—D. R. Lyson, July 15th. F. H. Burgess (A.C. II), July 26th. W. A. Herbert, J. C. Ainsworth, and L. E. West, July 28th. H. Spink, G. Haslam, J. H. Ball (temp. W.O. II), and E. Stroud, all July 30th.

Lt. (temp., R.N.V.R.).—W. C. A. Meade, graded a temp. commn. as Observer Lt., seny. Oct. 26th, 1916.

A.C. II F. H. Burgess granted a temp. commission as Lt., R.N.V.R., to date July 26th.

Temp. W.O. II J. H. Ball granted a temp. commission as Lt., R.N.V.R., with seny. June 30th.

August 1st.—Sub-Lt., R.N.V.R. (temp.).—W. Venables, promoted to Lt., R.N.V.R. (temp.), seny. June 23rd.

Messrs. J. W. Moore and L. Murphy have been entered as Lts, R.N.V.R. (temp.), seny. respectively July 24th and 29th.

Temp. commissions (R.N.V.R.) have been granted to the following, seny. as stated:—Lts.—A. L. Edwards and J. M. Auger, July 29th; J. L. Parsons, A. E. Hartley, and A. D. Wigram, July 31st.

August 6th.—Mr. R. Forbes-Bentley, D.S.C., granted temp. commission as Observer Lieutenant, seny. April 1st.

(*Continued on page* 397.)

AERONAUTICAL ENGINEERING

SUPPLEMENT TO "THE AEROPLANE"

INCORPORATING AIRCRAFT ENGINEERING, AERODYNAMICS, AND MATTERS PERTAINING TO THE AERONAUTICAL ENGINEER AND THE AIRCRAFT TRADER

The Production of Aeroplanes and their Components

(Eighth Instalment.)

BY STEPNEY BLAKENEY.

Making the Ailerons.

The spar can now be sent to the works Inspection Department, and, if passed, sent to the A.I.D. Inspector for final inspection, and then sent to the finished parts stores, ready for issue to the erectors.

The ribs for the aileron will be constructed in jigs similar to the rear portions of the ordinary long wing rib jigs, previously described and illustrated, as the aileron forms a part of the outer end of the wing, and is of the same contour and streamline section. About six ribs will be required, including the outer tip rib, which will be of slightly different constructon from the rest, being made with $\frac{1}{8}$-in. three-ply web.

The Trailing Edge.

The trailing edge consists of an ash bend terminating in a long straight portion which forms the whole of the trailing edge of the aileron, the width being about 1 in., of tapering cross section, which is about $\frac{3}{8}$ in. thick at the leading edge side, and tapering to the trailing edge to $\frac{1}{4}$ in. thick, this being rounded on the edge, these being the finished dimensions.

Unless the firm carrying out contracts involving steam-bending are used to doing this sort of work it is best to obtain the bends from firms who specialise in this class of work.

In ordering up the required ash bends, we should have to specify that the ash bends be made out of $1\frac{1}{4}$ in. by $\frac{5}{8}$ in. ash. This size would allow of all imperfections being machined out, when being machined up on the spindle.

A surplus of about 15 per cent. should be allowed for breakages, bad wood, bad bends, etc.

Machining Bends.

Having received the ash bends from the steam-benders, they can be taken from stores and passed into the wood machining department. The next thing to do will be to get the cutters for the vertical spindle made, together with the metal gauge of the section; these having been passed by the Inspectors, the work can be proceeded with.

This will be done by passing the bends past the cutter, in a manner similar to that used when spindling the leading edge of the wing.

The trailing edges of the ailerons when finished will then be examined by the Inspectors, and stamped by the A.I.D., if passed.

PLAN OF AN AILERON.

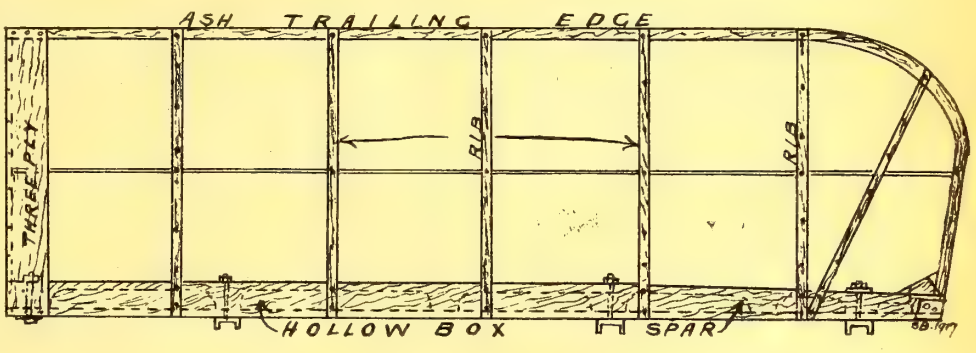


FIG. 15.

Assembling the Aileron.

The first thing to do now will be to assemble the aileron. To do this it will be best, if many are to be made, to make a couple of jig tables, left and right-hand, similar to those used for the fuselage erection. This table will be made, and cramped together, out of 6 in. by 1 in. flooring, covered with about $\frac{1}{4}$ in. three-ply sheets.

The spar can be laid on this jig table, and the necessary stops glued and screwed around it to keep it in position, taking care to miss the position of the ribs. The ribs can now be put on to the spar and squared up carefully, this being of considerable importance, after which they can be glued and screwed into their final position.

The ribs are held in their place square to the spar, and prevented from moving, by additional stops at the trailing end of the ribs, and also at their end next to the spar, thus ensuring their being square with the spar.

The trailing edge can now be threaded through the ends of the ribs, and the curved end of the ash bend attached and jointed to the spar. This should be done first, in case the jointing affects the radius of the curve. This procedure allows of any adjustment being made.

The next thing to do now is to complete the fixing of the ribs, this being done by the usual method of glueing and screwing. After this, the flanges can have their surplus ends cut off and rounded. The last part to be fixed is the spruce stay from the spar to the end rib, at the opposite end to the ash bend. (See Fig. 15.)

The aileron can now be inspected, and if passed by the Works Inspector, can be inspected by the A.I.D. and passed—with luck.

Finishing.

The skeleton aileron is now ready for varnishing, after which the hinge fittings can be attached, when the varnish is dry. It can then be inspected, and is ready for going to the covering shop to have the fabric put on and stitched up, exactly as in the wings.

The doping and varnishing only remains to be done.

The next thing to be constructed will be the tail-plane, elevators, the fin, and rudder; as they are constructed principally of metal, they will be constructed in the metal department, and to this department we shall now have to turn our attention.

A Retrospect.

We will, however, for a few minutes, retrace our work back to the fuselage, with which we commenced. The wood work is all completed, and the process of assembling with fittings which we had not made, has all been dealt with, and it is now necessary for us to consider the various methods of making a few of the required fittings.

On referring to Fig. 8, we see from the drawing that 12 strut fittings are required. In the fuselage, these consist of wiring plates, with a square steel shoe welded on, which takes the strut end. These fittings are simple, but require considerable care in making, as aeroplane parts consist usually of light designs with small factors of safety. Which means that what is made must without doubt be made from material strictly in accordance with the specification, and absolutely not under the sizes and dimensions shown on the drawings.

The slightest disregard of this will render all parts scrap; scrap means waste of labour and money, so don't forget this, it may save time. It is useless to try substitutes; go for absolutely the right thing first time, and have it.

Metal Fittings.

As we have only a small order with which to deal, it will be useless to consider, at this stage, the production and use of punches and dies for the production of these parts, as the quantity is insufficient.

The die and punch would cost almost more than the fittings, and probably take longer to make than making all the fittings more or less by hand. When I say by hand, I mean by sawing out on the metal jig saw and filing up to a scriber line or a template, whichever method is adopted. The template, which is case-hardened, is no doubt safer, but it involves time in making templates, which could be more usefully employed in this case on actual production, namely, all hands being employed on filing up wiring plates to a scriber line, and finishing off with a fine smooth file, preferably by the most skilled hands.

Wiring Plates.

Having considered the three methods of production, namely, stampings; rough cutting-out, and filing up to a case-hardened template; or filing up a rough cutting to an accurate scriber line, I propose, in this case, to use the last, as speed is everything in our days. Therefore, I propose to detail the organisation and operations of producing the wiring plates and similar parts by this method.

We should now refer to the general arrangement drawing of the fuselage, and from the particulars given thereon ascertain the drawing and part number of each fitting, and obtain the necessary drawings. They will be sent to the planning department, who will examine the drawing, and ascertain its particulars, such as the material required.

In this case it will be mild sheet steel, the specification mentioned in the schedule, and passed by the A.I.D.

They will also detail out the operations on the instruction card to be sent into the works, the best way of producing the fittings and the sequence of operations, and full particulars of the gauge, etc., to be used. They should also, before issuing the instruction card to the works, ascertain if the material is available in the stores.

If it is, then they will fill in and issue to the stores a material requisition for the amount of the metal required to complete the fittings and the parts, as ordered for the first batch.

Having done this, the order goes to the foreman of the metal shop, and the metal is also sent from the stores to the metal shop.

(To be continued.)

RESULTANT FORCES.

The following question has been received:—

On page 13 of "Mechanics of the Aeroplane" (Duchene) will be found:—"If during horizontal flight, the engine is stopped (without interfering with the elevator), the aeroplane glides—but its velocity of flight remains *practically* the same as before."

Further down:—Engine started whilst gliding. "But if the elevator remained untouched, that is, if the angle of incidence were not varied, the speed of the aeroplane would *always remain the same.*"

Firstly, the two conditions of flight (horizontal) mentioned in the above paragraphs are more or less identical, therefore, to what extent do "practically" and "always remain the same" hold good?

Now when the machine is in horizontal flight due to the thrust and through the angle of incidence of CD, an upward force is exerted on CD at P = PQ, and also a backward force, PS at P. PQ must be equal and opposite to PO (gravity).

These two forces can be transformed into the parallelogram of forces PQRS, giving the resultant PR. PR is therefore greater than PQ. But PQ equals PO.

Therefore, obviously, PR is greater than PO, which is O.K.

But when the engine is off and the machine glides:—It can be seen that PR will assume (if not directly opposed to PO) certainly a more vertical position than PQ.

Now if it be true that the speed remains constant, then all the forces will remain constant. Therefore, PR will be opposed to PO. But (as per above) PR is greater than PO (gravity). Therefore, why does the machine come down at all?

The following reply is given by our side-rule specialist:—

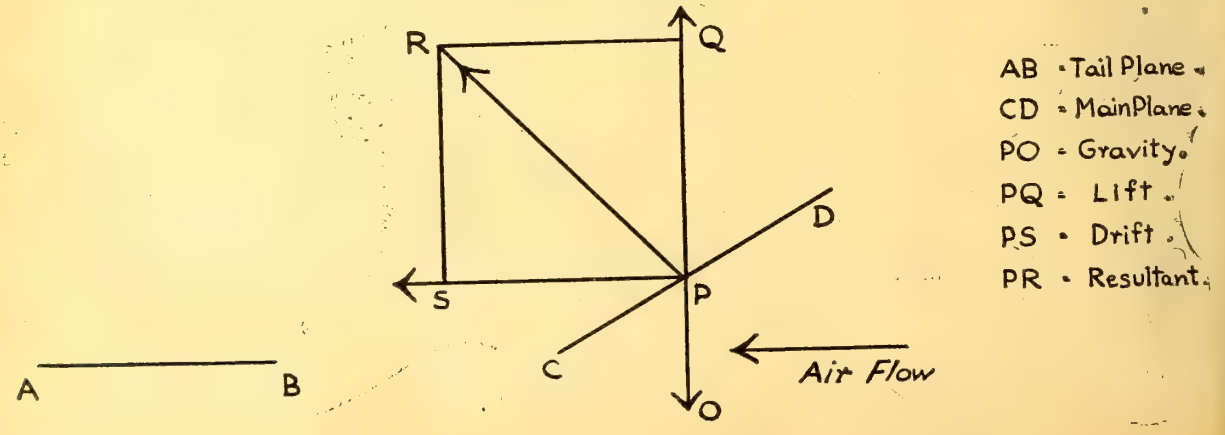
If the speed and angle of incidence remain unaltered—then, whether gliding or flying, the resultant forces on the aeroplane remain unaltered relatively to the machine.

Since the altitude of the machine, relative to the earth, will alter according to the flight path of the machine—the direction of the gravity force will alter relatively to the machine, and, therefore, relatively to the resultant forces acting on the wings.

If, therefore, the machine is in equilibrium when flying horizontally—it will be so no longer if gliding downwards at exactly the same speed.

But the change in the value of the strictly vertical component of the total reaction on the wings changes by a relatively small amount with the change of altitude of the machine, and the variation in speed required to bring the vertical component back to equality with the weight is smaller still— hence, for practical purposes, it may be said that the speed remains constant.

From the strictly mathematical point of view the statement is not correct however.



THE BRITISH PETROLEUM CO., LTD.

The Directors of the British Petroleum Company, Ltd., and the Homelight Oil Co., Ltd., announce to their clients that the whole of the issued share capital of these Companies has been purchased by the Anglo-Persian Oil Company, Ltd., and that no other Company or persons have now any interest direct or indirect in the management or control.

In the Anglo-Persian Oil Co., Ltd., His Majesty's Government holds a controlling interest, the balance of the capital being entirely in British hands, consequently the British Petroleum Company and the Homelight Oil Company will be absolutely free from all foreign influences.

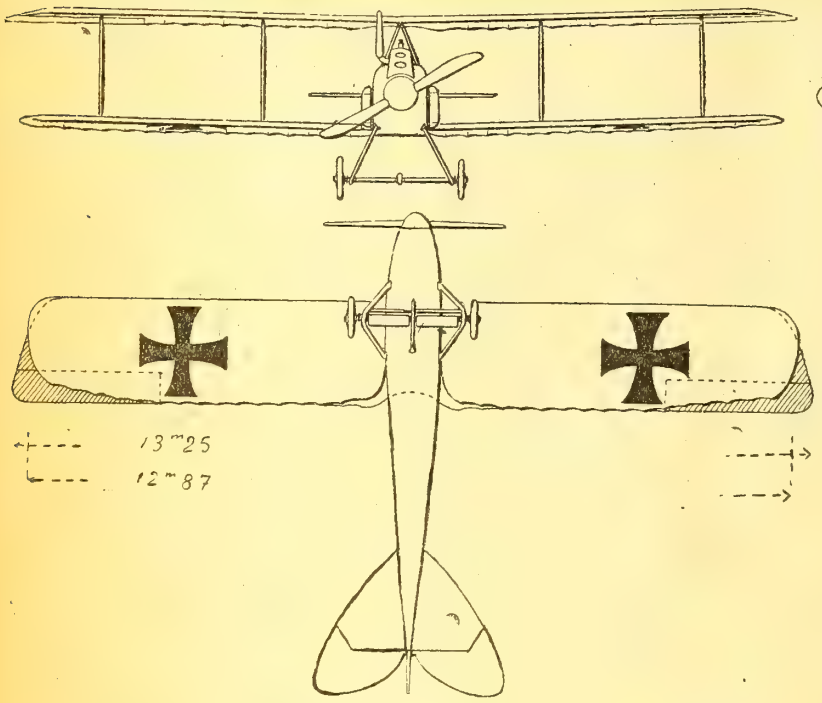
There will be no alteration in the conduct or management, which will be carried on under the control of the new Board with the present officials and staffs of the Companies, all of whom are British.

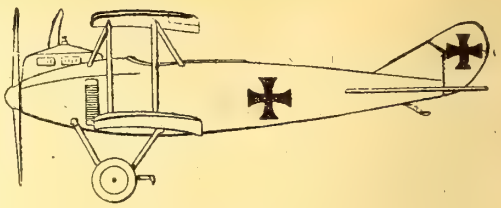
National interests have made it necessary for these Companies to curtail their business for the time being, but it is intended to resume with increased activity the full business of the Companies as soon as normal conditions prevail.

A QUESTION OF BUYING.

An aircraft firm of the first class requires an experienced buyer of aeronautical stores. If there happens to be such a person at liberty, he would do well to communicate with the Editor of this paper.

GERMANY'S MODERN AEROPLANES.





THE D.F.W. AVIATIK, TYPE C.V.

Span.—Upper, 13.25 metres (43 ft. 8 in.).
Span.—Lower, 12.85 metres (42 ft. 5 in.).
Chord.—1.75 metres (5 ft. 9 in.).
Surface.—42.5 sq. metres (421 sq. ft.).
Gap.—1.7 metres (5 ft. 7 in.).
Engine.—228-h.p. Benz.

POINTS TO NOTE.

Wings of almost equal span. Two pairs of struts per side. Rounded lower plane. Fin to end of fuselage, with rudder-balance above it. Heart-shaped tail, with elevator balance on each side. Round-backed fuselage with pot on propeller.

THE D.F.W. AVIATIK, TYPE CV.

The Deutsche Flegzeug Werke Gesellschaft was well known in peace-time for its somewhat ungraceful aeroplanes, some of them with crescent-shaped wings, and others with arrow-shaped wings similar to those of the Austrian Lohner biplanes.

This firm has since produced a somewhat different machine, which, according to M. Lagorgette of "L'Aérophile," is in favour in Germany, and is not only constructed in the firm's own works, but also in those of the Aviatik und Automobil Aktien Gesellschaft, at Leipzig-Heiterblick.

The wings have a dihedral, but are not swept back. The span of the lower wings (12.85 m. or 42 ft. 5 in.) is nearly equal to that of the upper wings (13.25 m. or 43 ft. 8 in.).

The ends of the upper planes are oblique, those of the lower planes retreating and rounded.

Their maximum chord is 1.75 m. (5 ft. 9 in.). The total lifting surface is about 42.5 sq. m. (421 sq. ft.). The gap is considerable, namely, 1.7 m. (5 ft. 7 in.), which gives the machine a tall appearance.

The wings progressively wash out from root to tip. The lower wings have an incidence of 6 deg. near the fuselage as far as the third rib. This decreases to 4.3 deg. at the 13th rib, which is placed 0.4 m. beyond the external struts.

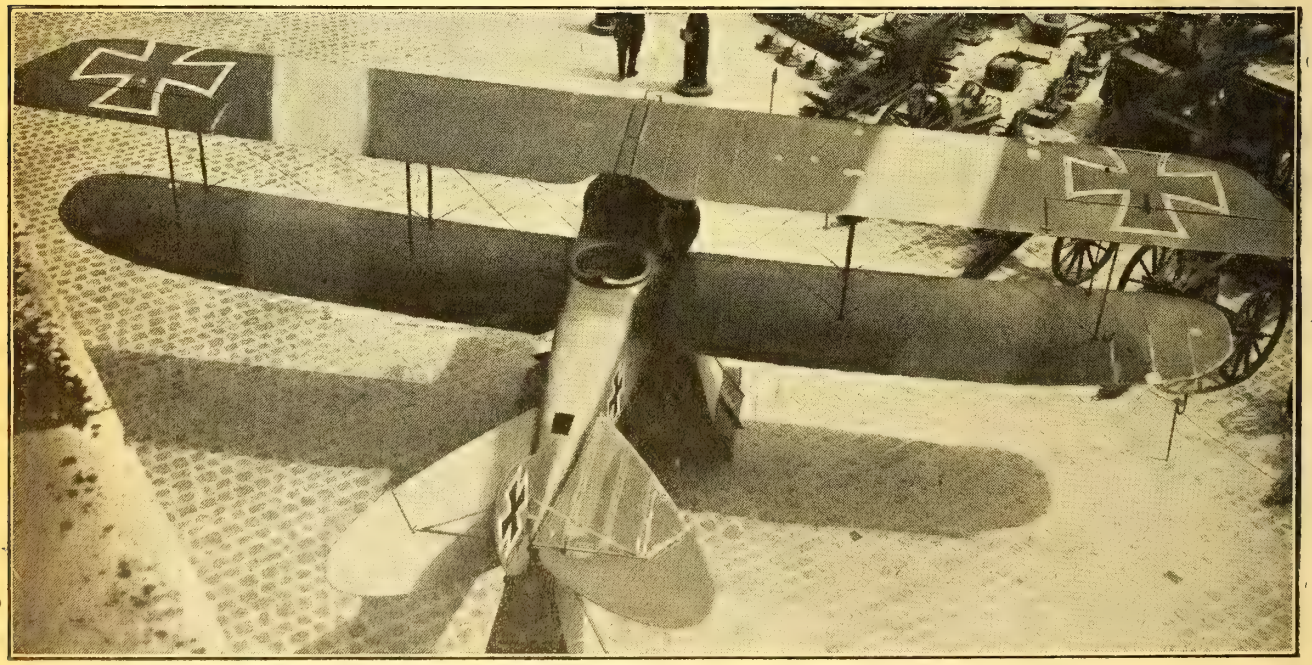
The incidence of the upper plane is 5 deg. from the cabane to the sixth rib, and 3.3 deg. at the 13th rib, where the aileron commences. The incidence on the right and left wings is uniform.

The cabane is of traditional D.F.W. type, trestled-shaped, and constructed of four struts 1.25 m. long.

Above the cabane is a central wing section, 13 centimetres wide, to which the upper main planes are attached, and which contains a small reservoir holding about 3 litres.

There are two pairs of struts on each side of the fuselage.

The distance between the front and rear spars, and consequently between front and rear interplane struts, is 0.76 m.,



A CAPTURED D.F.W. AVIATIK ON EXHIBITION IN PARIS; demonstrating how the French authorities educate the French Aircraft Industry.

considerably less than half the chord of the wing. The spars taper considerably towards the ends, and are lapped with fabric.

In addition to the four cables which connect the wing attachments on the cabane and the fuselage to the summits and bases of the inner struts, there is a cable which runs between the top of the front chassis strut and the top of the rear inner interplane strut.

The rectangular ailerons are 2.45 m. by 0.5 m., with rounded ends. Their frame is metallic, as are the frames of the fixed tail planes.

The control planes preserve the appearance of the early models. The fixed stabilising plane is 1.72 m. long and is supported by two tubes, and together with the elevator flaps has a heart-shaped appearance, with a span of 3 m. The rudder, fixed vertical fin, and the end of the fuselage together present the contour of a spatula, a trifle elevated.

The controls differ, however, from earlier models, in that the elevator flaps and the rudder are balanced by triangular extensions which conform to segments cut from the fixed planes.

The fuselage terminates in a vertical knife-edge, rather shallow in depth. The section is rectangular with rounded edges.

As in earlier models, it is entirely covered with three-ply, which is painted with green and brown camouflage streaks. The underneath of the wings is a bright yellow. The rest of the machine is green and brown.

The nose of the machine, and its propeller pot, are somewhat pointed, thus avoiding blanketing the centre part of the propeller.

The landing-carriage is standard, the wheelbase being 2 metres wide. The suspension is rubber cord. The cross-axle is streamlined. There is cable cross-bracing between the front chassis struts. There is a claw brake.

The motor is a fixed Benz, giving 228 h.p. at 1,410 r.p.m. The cylinders are almost entirely enclosed in a special cowl.

The propeller, a 3-metre "Wotan," is made of ash and walnut in alternate layers.

The radiators are placed on the sides of the fuselage, where they form rather deep projections (14 cm.), and are 75 cm. high and 21 cm. from front to back. Their base is found between the front chassis strut and the leading edge of the lower wing. They are made by Hans Windhoff.

The water reservoir on top of the engine is triangular like that in the Albatros D.I.

The pilot sits upon the petrol tank, which also forms a back and arm-rest. He has a machine-gun placed to the right of the motor.

The passenger sits behind, surrounded by a gun-ring.

There is only one bomb-release for six bombs, placed one above another.

The full load is 950 kgs. (2,100 lbs.), of which, 300 kgs. (660 lbs.) is useful load.

THE REX FIGHTING BIPLANE.

The chaser-biplane, constructed by the Rex Company of Cologne, is not definitely known to have been used on active service on the Western Front.

The information available shows it to be a single-seater fighter of the D.II type.

The machine offers a striking resemblance to the Nieuport, the more especially because the lower wings have a span slightly less than that of the upper wings (about 9 metres), and a much smaller chord. In fact, the lower plane is smaller and lighter in all its aspects.

Contrary to Nieuport practice, the lower wings have no dihedral, and it is almost certain that they are not swept back. The upper wings are trapezoidal in plan view.

There is only one pair of interplane struts on either side of the fuselage, which are arranged "V" fashion as in the Albatros D.III.

The upper wings are placed very close to the fuselage, and are attached to a central section, which is supported by short splayed-out struts reinforced with wire bracing.

The elevating planes are placed in line with the axis of the motor, and have no incidence.

The rudder is very tall, and is believed to be placed entirely above the fuselage, as in the Albatros fighter.

The fuselage is a three-ply monocoque, with projecting flats for the attachment of the lower wings.

The landing-carriage is ordinary "V" type, with cable cross bracing.

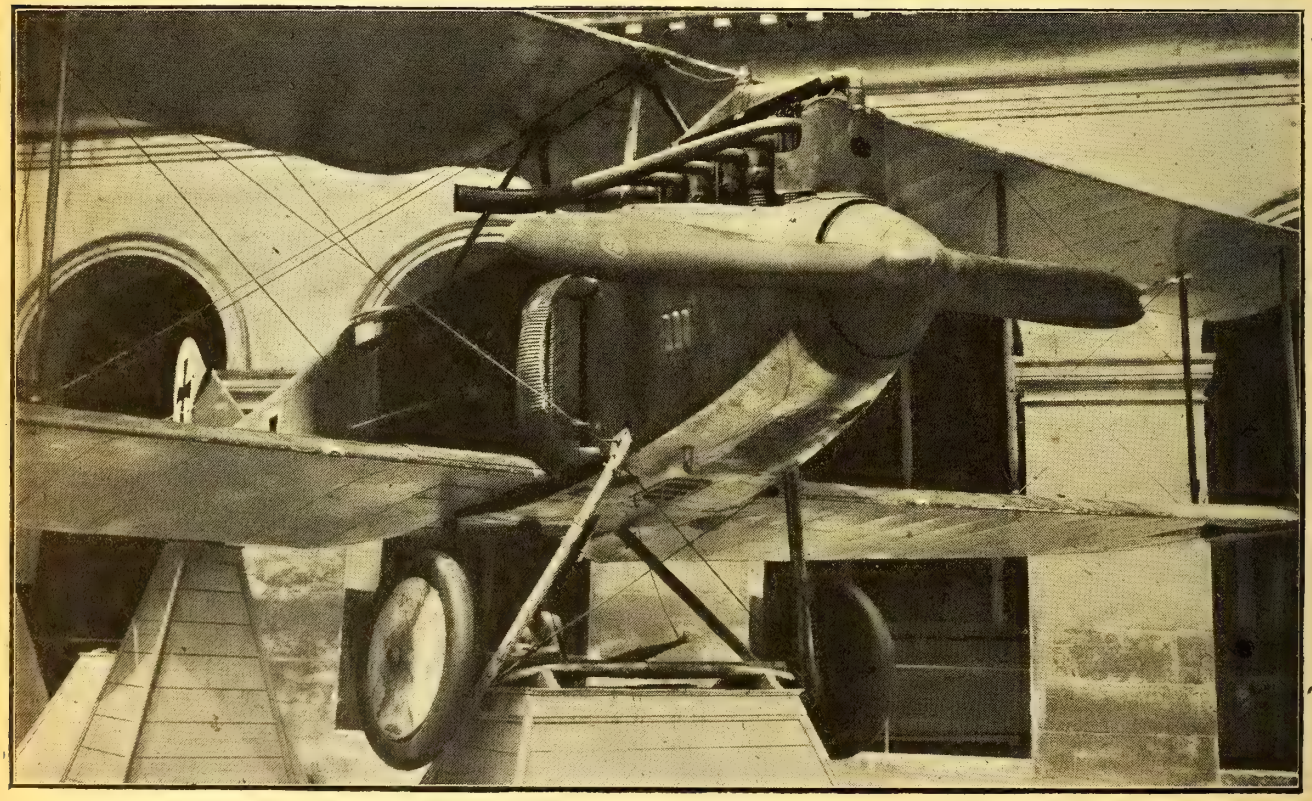
The Rex is apparently always fitted with a rotating monosoupape Rex engine (Gnôme type), and carries a machine-gun placed to the right and synchronised with the motor.

This machine may be distinguished from the Albatros D.III by the absence of a dihedral to the lower plane.

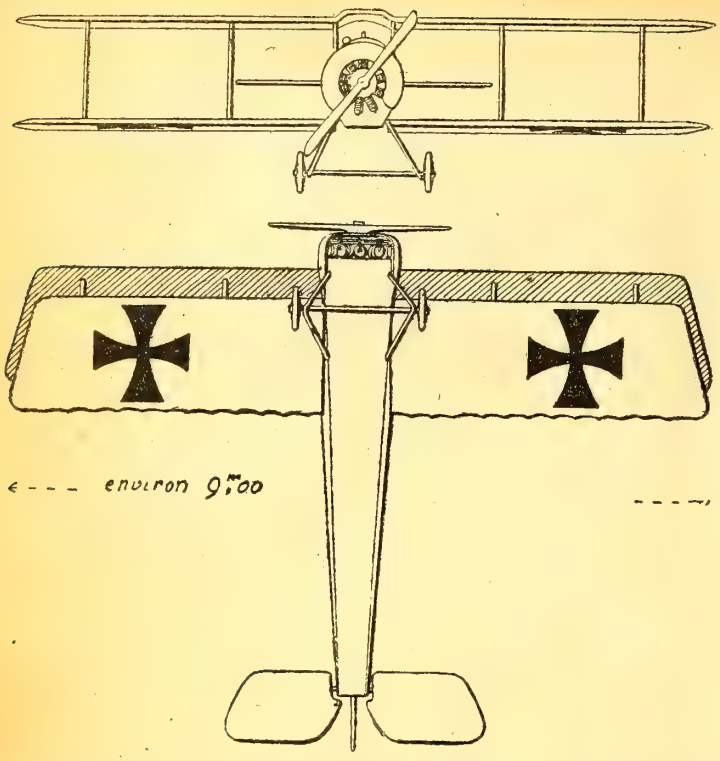
THE AGO FIGHTING BIPLANE.

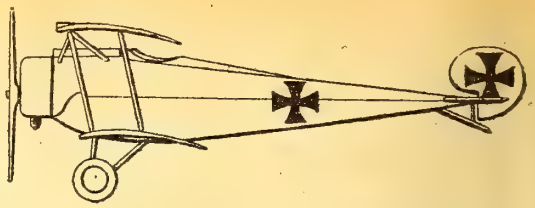
Aeroplanes built by the Aktien Gesellschaft Otto are not seen at the front in large numbers. In addition to the large twin fuselage machine, which has not been very successful, the firm constructs general purpose two-seater machines of medium size, with two pairs of interplane struts on either side of the fuselage, and small single-seat biplanes, with one pair of struts on either side.

These last machines differ from the Nieuport in that they



FRONT VIEW OF THE CAPTURED D.F.W. AVIATIK IN PARIS.—The shape of the nose shows clearly how the Germans obtain better propeller efficiency than we do, and also how, by fitting their radiators directly in the slip-stream, they manage to run big engines with small radiators. These points contrast favourably with our own methods.





THE FOKKER FIGHTING BIPLANE.

Span.—30 ft.
Length.—24 ft.
Chord.—5 ft.
Motor.—100-h.p. Oberursel.

POINTS TO NOTE.

Raised centre section of top plane.
Equal span of top and bottom planes.
Hexagonal sectioned fuselage.
Morane type elevator.
"Comma"-shaped rudder.

have a dihedral to the upper plane, but the wings are not swept back. The chord of the lower wings is small, and, therefore, they appear to be narrow. The struts are parallel and not V-shaped as in the Nieuport.

THE FOKKER BIPLANE.

M. Jean Lagorgette, writing in "L'Aerophile" of June 15th, points out that the Fokker monoplane is no more used except on the Eastern fronts, and that this make is now represented on the Franco-British front by a single-seater biplane, which differs from the 1915 biplane with small lower wings.

The newer biplane with lower wings equal to upper wings was illustrated by Mr. Geoffrey Watson many months ago in The Aeroplane, but a detailed description of the machine is not without interest.

Various models have been built, some with the 100-h.p Oberursel rotary engine, and others with the 175-h.p. stationary six-cylinder Mercédès. No specimen is available in sufficiently good condition for exact dimensions to be procured.

The span of the machine is about 9 metres; length, 7 metres; height, 2.5 metres; chord of wings, 1.5 metres.

The lower wings are exactly similar to the upper wings, neither have a dihedral nor an "arrow." The tips are slightly oblique, the gap is very small (1.3 metres).

The upper wings are attached to a low cabane of Nieuport type, and almost touch the top of the fuselage, to such an extent, in fact, that they have to be raised in front, and very much cut away at the rear to permit the use of the machine-gun.

There is a marked stagger. The two pairs of struts on either side are made of steel tube with streamline fairings, as is the landing carriage.

The lateral control is not obtained by ailerons, as in other biplanes, but by warping of the upper and lower wings by means of two cables which connect the control lever with the tops of the four rear interplane struts, and two others which attach to their base, and pass over the top of the cabane. The struts are not braced fore and aft.

Between each pair of ribs, the fabric is kept in place from the leading edge to the front main spar by three intermediate beadings.

The rudder is in the form of a comma, but a trifle like the Nieuport, and projects farther back towards the rear than in the Fokker monoplane.

The elevators are similar to those of the Morane.

The big Morane type fuselage, hexagonal in section, flattens off towards the rear, but the whole thing has the form of a monocoque, and the general appearance of a whale.

The landing carriage is of simple form, no longer an "M" seen from the front, as in the Morane, and with complicated tubes behind, but two simple "Vs" pointing towards the front as in certain later Moranes.

The motor is a monosoupape type Oberursel—practically a Gnome—with a cowl identical with that on the monoplane, but with its cheeks cut away at the bottom.

The propeller is usually a Garuda.

A fixed machine-gun, in the case of the stationary type motor, is placed to the right of the motor. In the case of the type with rotary engine, the gun is mounted above the cowl, slightly to the right. In some cases there are two machine-guns.

The wings, fuselage and tail are painted green and brown, and the underpart of the wings a clear sky-blue, which, one gathers, is quite effective at high altitudes.

This machine is likely to be confused with the Nieuport, though it is a mixed copy of Nieuport, Spad, and of British machines, and of the single-engined Morane biplane, a machine which is not used on service by the French Army, nor is it much more in fashion in the British Army.

The Fokker differs from the Morane biplane in that its wings have two pairs of struts on each side of the fuselage, instead of a single pair, and in that it is slightly staggered (less so than certain similar British biplanes), and it is less trapezoidal in plan view. Contrary to previous practice, in these cases the French machine possesses a vertical tail fin as well as a rudder, and the German machine has no fin, but only a comma-shaped (balanced) rudder.

If its control members resemble those of a Nieuport—(which they do not.—Ed. The Aeroplane)—the machine differs in the absence of an overhang on the top plane of the dihedral, and of the small appearance of the lower wings, also because of the two rows of struts, which are not "V" shaped, and, again, because of the narrowing of the fuselage towards the tail, when viewed in side elevation.

THE L.T.G. "TORPEDO BIPLANE," TYPE D.

The Luft Torpedo-Gesellschaft of Johannisthal, a company which has recently been established manufactures a fighting aeroplane, nearly similar in appearance to the Albatros fighter.

The wings have no dihedral nor are they swept back, and the chord of the lower planes is slightly less than that of the upper.

The upper wings meet the top of the fuselage.

On either side there is one pair of interplane struts; placed closely one behind the other (the rear spar has behind it more than half of the wing), and the struts approach one another slightly towards their bases.

The ailerons do not project, and are compensated by a forward projection, as in other new German machines.

The tail planes are like those of the Albatros fighter. The rudder and fixed fin are similarly placed above the fuselage, but are slightly more oval.

The landing-carriage, especially its rear members, is placed somewhat farther forward than usual. The propeller has a revolving pot. The motor is of the fixed variety and gives 175-h.p.

The · Aeroplane ·

Acetylene Welding Plant—

Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—

Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation, Newcastle-on-Tyne."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2 City 7724.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.

Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."

Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."

Martinsyde, Ltd., Brooklands, Byfleet. Woking 331; Byfleet 171. "Martinsyde, Weybridge."

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455 "Nieuscout, Crickle, London."

Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."

The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. Putney 2240-2241, "Carbodis, London."

Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerfyta, Knights, London."

Waring & Gillow, Ltd., Hammersmith. Museum 5099. "Warisen, Ox, London."

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

White, J. Samuel, & Co., Ltd East Cowes. Cowes 3. "White, East Cowes."

Airships—

Airships, Ltd., High Street, Merton. Wimbledon 1314.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, 'Phone, London."

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Bizfibild, London."

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.

The Wilfley Co., Ltd., Salisbury House, London Wall, E.C.2 City 2681-2. "Wrathless, Phone, London."

Cable Coverings and Cable Controls—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Capstan Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Castings (Aluminium, Brass, Bronze, Machined or Rough)—

Coan, R. W., 219, Goswell Road, London, E.C.1 City 3846. "Krankases, Isling, London."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."

London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."

Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—

Accles & Pollock, Ltd. Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."

B. D. V. Aircraft Spares, Syon Chambers, 16a, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—

British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."

British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Clarke, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Elastic Cords—

Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—

Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. Midland 981. "Fahrenheit, Birmingham."

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—

E. Kalker & Co., Coventry. Coventry 241. "Kalker, Coventry."

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford No. 1. "Pump, Bedford."

Arrol-Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."

The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000.

Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. Gerrard 238. "Beardmore, London."

Dudbridge Iron Works, Ltd. (Salmson), 87, Victoria Street, London, S.W.1. Vic. 7026. "Aeroflight, Vic., London."

Gordon Watney & Co., Ltd., Weybridge. Weybridge 550 (7 lines). "Mercédès, Weybridge."

Green Engine Co., Ltd., Twickenham. Richmond 1293.

Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. Hammersmith 1910. "Gwynne, Hammersmith."

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sturtevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Moorfield, Wolverhampton."

The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W.. Walthamstow 408 (2 lines). "Elevenfold, London."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Flexible Shafts—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Flying Schools—

Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. Bournemouth 1160 "Etches, Winton."

Cambridge School of Flying & Aerodrome Co., Ltd., 30b, St. Andrews Street, Cambridge.

Galvanising—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Cowper-Coles Manufacturing Co., Sunbury-on-Thames. Sunbury 37.

Gears—

Moss Gear Co., Ltd., Thomas Street, Aston, Birmingham. East 407. "Mosgear, Birmingham."

Glue—

Improved Liquid Glues Co., Ltd., Gt. Hermitage Street, E. (Croid.). Avenue 3178. "Excroiden, Wapp, London."

Mendine Co., 8, Arthur Street, E.C. Bank 5873.

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines). "Comyn, Ching, Westcent, London."

Chas. P. Kinnell & Co., Ltd., 65 & 65a, Southwark Street, London, S.E.1. Hop 372 (2 lines). "Kinnell, London."

Instruments—

British Wright Co., Ltd., 33, Chancery Lane, W.C.2. Holborn 1308.

Instruments (Scientific, Altimeters, Speed and Pressure Gauges, etc.)—

Short & Mason, Ltd., Macdonald Road, Walthamstow, E.17. Walthamstow 180. "Aneroid," Phone, London

Machine Tools—

Brewster & Co., 11, Queen Victoria Street, E.C.4. City 768. "Circumfuse, Cannon, London."

Magneto Driving Pieces—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Magnetos—

The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. 1908-1009 Coventry. "Corlton, Coventry."

The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. Museum 430. "Vicksmag, Phone, London."

Metal Manufacturers—

Chas. Clifford & Sons, Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

Metals in General—

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

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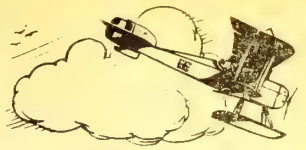


Metal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."
Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."
Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2297.
Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041. "Bayliss, Wolverhampton."
The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow, London. Hounslow 254. "Golshel, Hounslow."
Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. Museum 70. "Installing, Eusroad, London."
Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261. "Fremo, Birmingham."
Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."
Selsdon Engineering Co., Ltd., Croydon. Croydon 1761-123. "Selig, Cent, London."
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."
Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

Metal Shearing Tools—

Montgomery, Smith & Co., Ltd., Tangent Works, Keynsham, near Bristol. Keynsham 21. "Ingenuity, Salford."

Metal Spinnings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Metric Bolts—

Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

Miscellaneous—

Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."
Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C. Central 3731.
Bowdon Wire, Ltd., Willesden Junction. Willesden 2400 (3 lines). "Bowirelim, Harles, London."
Brown Bros., Ltd., Great Eastern Street, E.C.1. London Wall 6300. "Imbrowned, Bethroad, London."
Edison Swan Electric Co., Ponder's End. (Lamps). Enfield 520 (6 lines). "Ediswan, Enfield."
Herbert Frood Co., Ltd., Chapel-en-le-Frith. Central 793. "Frodobrake, Birmingham."
Glasso Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.
London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—

Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
Standard Motor Car Co., Coventry. Coventry 530 (4 lines). "Flywheel, Coventry."

Observation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Packers, Shippers, Etc.—

Lep Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depolep, London."

Patent Agents—

King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.
Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.
Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Petrol Storage (Bulk)—

Bywater & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. Gerrard 2220. "Bywaterist, London."

Piston Rings—

British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—

Bliss, E. W., Co., 2a, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissdon, London."

Presswork—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."
Integral Propeller Co., Ltd., Hendon 9. Kingsbury 104. "Aviprop, Hyde, London."
Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."
Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Stanley Aviation Co, 67, Kingsland Road, E.2. City 8347.
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil"

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—

C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. Chapeltown 474. "Instrument, Leeds."

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The Norman Thompson Flight Co., Ltd., Middleton, Bognor. Bognor 48. "Soaring, Bognor."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Short Bros., Rochester. Chatham 627. "Seaplanes, Rochester."
Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Shackles—

The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. Hounslow 254. "Golshel, Hounslow."

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.
Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sheet Metal Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Shock Absorbers (Elastic Cord)—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—

Forward Motor Co., Summer Row, Birmingham. Central 6259.
Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.
Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."
Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—

Dart Spring Co., West Bromwich. West Bromwich 322. "Dart, West Bromwich."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—

Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."
Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield"

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—

Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—

John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.
James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London"
R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."
The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Weskent."

Varnishes—

Clarke, R. Ingham, & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."
Harland, W., & Son, Merton. Wimbledon 45.
Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."
Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Washers—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Watchmakers and Jewellers (Silver Models)—

Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—

Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."
London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—

Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wiremill, Musselburgh."
Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

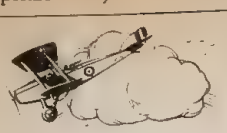
Wirework—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Woodworking Machinery—

Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."
Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."
Wadkin & Co., Leicester. Leicester 3614. "Woodworker, Leicester."

The Aeroplane Buyers' Guide



Acetylene Welding Plant—
Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—
Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation. Newcastle-on-Tyne."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2 City 7724.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1143-1145.

Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1170. "Aircraft, Eastbourne."

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."

Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."

Martinsyde, Ltd., Brooklands, Byfleet, Woking 331; Byfleet 171. "Martinsyde, Weybridge."

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455 "Nieuscout, Crickle, London."

Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."

The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. Putney 2240-2241, "Carbodis, London."

Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerlyte, Knights, London."

Waring & Gillow, Ltd., Hammersmith, Museum 5000. "Warisen, Ox, London."

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

White, J. Samuel, & Co., Ltd. East Cowes. Cowes 3. "White, East Cowes."

Airships—
Airships, Ltd., High Street, Merton. Wimbledon 1314.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested. 'Phone, London."

Aluminium Castings—
Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—
Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

Bearings (Etonia Cast Phosphor Bronze)—
Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Fairey Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Bizbild, London."

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.

The Walker Co., Ltd., Salisbury House, London Wall, E.C.2 City 2681-2. "Wrathless, Phone, London."

Cable Coverings and Cable Controls—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Capstan Work—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Carburettors—
Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4070.

Castings—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Castings (Aluminium, Brass, Bronze, Machined or Rough)—
Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—
Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—
Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."

London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—
Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."

Hozel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."

B. D. V. Aircraft Spares, Syon Chambers, 160, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aeracraons, Canning, London."

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—
MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—
British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."

British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Clarke, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Elastic Cords—
Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—
Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. Midland 981. "Fahrenheit, Birmingham."

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—
E. Kalker & Co., Coventry. Coventry 242. "Kalker, Coventry."

Engines and Parts—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford No. 1. "Pump, Bedford."

Arrol-Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."

The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000.

Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. Gerrard 238. "Beardmore, London."

Dudbridge Iron Works, Ltd. (Salmson), 67, Victoria Street, London, S.W.1. Vic. 7006. "Aeroflight, Vic, London."

Gordon Watney & Co., Ltd., Weybridge. Weybridge 550 (7 lines). "Mercedes, Weybridge."

Green Engine Co., Ltd., Twickenham. Richmond 1293.

Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. Hammersmith 1910. "Gwynne, Hammersmith."

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sturtevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Moorfield, Wolverhampton."

The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W. Walthamstow 308 (2 lines) "Elevenfold, London."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Flexible Shafts—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Flying Schools—
Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. Bournemouth 1160 "Etches, Winton."

Cambridge School of Flying & Aerodrome Co., Ltd., 30b, St. Andrews Street, Cambridge.

Galvanising—
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Cowper-Coles Manufacturing Co., Sunbury-on-Thames. Sunbury 37.

Gears—
Moss Gear Co., Ltd., Thomas Street, Aston, Birmingham. East 407. "Mosgear, Birmingham."

Glue—
Improved Liquid Glues Co., Ltd., Gt. Hermitage Street, E. (Croid.). Avenue 3178 "Excroiden, Wapp, London."

Mendine Co., 8, Arthur Street, E.C. Bank 5813

Goggles—
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340 "Shatterlys, Piccy, London."

Heating and Ventilating—
Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines) "Comyn, Ching, Westcent, London."

Chas. P. Kinnell & Co., Ltd., 65 & 93, Southwark Street, London, S.E.1. Hop 372 (2 lines). "Kinnell, London."

Instruments—
British Weight Co., Ltd., 33, Chancery Lane, W.C.2. Holborn 1308

Instruments (Scientific, Altimeters, Speed and Pressure Gauges, etc.)—
Short & Mason, Ltd., Macdonald Road, Walthamstow, E.17. Walthamstow 160. "Aneroid." Phone, London

Machine Tools—
Brewster & Co., 11, Queen Victoria Street, E.C.4 City 768. "Circumfuse, Cannon, London."

Magneto Driving Pieces—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Magnetos—
The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. 1908-1909 Coventry. "Corlton, Coventry."

The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. Museum 430. "Vicksmag, Phone, London."

Metal Manufacturers—
Chas. Clifford & Sons, Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

Metals in General—
Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

Metal Parts and Fittings—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."

Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2207.

Bayliss, Jones & Bayliss, Ltd., Wolverhampton 1041. (Bolts and Nuts.) "Bayliss, Wolverhampton."

The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow, London. Hounslow 254. "Golshel, Hounslow."

Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. Museum 70. "Installing, Eusroad, London."

Mountford, Fredk., Ltd., Fremo Works, Lilford, Birmingham. Kings Norton 261. "Fremo, Birmingham."

Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."

Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."

Selsdon Engineering Co., Ltd., Croydon. Croydon 1761-123. "Selig, Cent, London."

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aeracraons, Canning, London."

Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

Metal Shearing Tools—
Montgomery, Smith & Co., Ltd., Tangent Works, Keynsham, near Bristol. Keynsham 21. "Ingenuity, Salford."

Metal Spinnings—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Metric Bolts—
Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

Miscellaneous—
Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."

Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C. Central 3731.

Bowden Wire, Ltd., Willesden Junction, Willesden 2400 (3 lines). "Bowirelim, Harles, London."

Brown Bros., Ltd., Great Eastern Street, E.C. London Wall 6300. "Imbrowned, Bethread, London."

Edison Swan Electric Co., Ponder's End, (Lamps), Enfield 520 (6 lines). "Ediswan, Enfield."

Herbert Frood Co., Ltd., Chapel-en-le-Frith, Central 703. "Frodobrake, Birmingham."

Glaso Manufacturing Co., Ltd., 211, City Road, E.C. City 0558.

London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."

MacLennan, J., & Co., 30, Newgate Street, E.C.1, and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—
Arrol-Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."

Standard Motor Car Co., Coventry. Coventry 539 (4 lines). "Flywheel, Coventry."

Observation Panels—
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Packers, Shippers, Etc.—
Lep Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depolep, London."

Patent Agents—
King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.

Page & Rowlinson, 27, Chancery Lane, E.C.4. Central 332.

Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Petrol Storage (Bulk)—
Bywater & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. Gerrard 2220. "Bywaterist, London."

Piston Rings—
British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—
Bliss, E. W., Co., 20, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4330. "Blissdon, London."

Presswork—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Propellers—
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."

Integral Propeller Co., Ltd., Hendon 9. Kingsbury 104. "Aviprop, Hyde, London."

Long Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."

Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Stanley Aviation Co., 67, Kingsland Road, E.2. City 8347.

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

Rigging for Aircraft—
Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—
The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—
C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—
Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—
The Foster Instrument Co., Letchworth, Herts. Chapeltown 474 "Instrument, Leeds."

Seaplane Manufacturers—
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellers, Leeds."

The Norman Thompson Flight Co., Ltd., Middleton, Bognor Bognor 48. "Soaring, Bognor."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Short Bros., Rochester, Chatham 627. "Seaplanes, Rochester."

Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—
Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Shackles—
The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. Hounslow 254. "Golshel, Hounslow."

Sheet Metal Pressings—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellers, Leeds."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.

Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sheet Metal Work—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Shock Absorbers (Elastic Cord)—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—
Forward Motor Co., Summer Row, Birmingham. Central 6259.

Hobson Manufacturing Co., 20, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."

Ripault, Leo, & Co., Ltd. (Oleo Plugs), 62a, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—
Dart Spring Co., West Bromwich. West Bromwich 322 "Dart, West Bromwich."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—
Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."

Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—
Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Steel Tubes for Aeroplanes—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—
Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lilford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—
John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

James North Hards & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—
Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London."

R. F. & F. W. Brown, Wollaston Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—
Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—
The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."

The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Westkent."

Varnishes—
Clarke, R. Ingham, & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Harland, W., & Son, Merton, Wimbledon 45.

Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."

Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Washers—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Watchmakers and Jewellers (Silver Models)—
Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—
Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—
Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."

London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—
Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wiremill, Musselburgh."

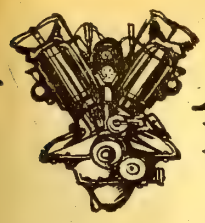
Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Wirework—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

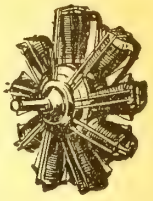
Woodworking Machinery—
Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."

Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."

Wadkin & Co., Leicester. Leicester 3614. "Woodworker, Leicester."



AERO-MOTORS
IN KIND AND CONSTRUCTION



By Geoffrey de Holden-Stone

Suggestions and Queries.

What every woman—and an occasional author—knows, is that to sustain anything like protracted interest, you must keep people guessing. Only do that, and all will be forgiven. So the element of surprise—even to the ultimately handed lemon—becomes essential. And to none more, I imagine, than myself in respect of these discourses on the diversities and perversities of aero-motors, kind or unkind.

Here it is then. So far it may have been noticed that I have merely described how the Chadderton mechanical scheme resembles that other. And how it differs. Also, wherein its physical cycle is different from any other two-stroker. And likewise, how the Chadderton motor is intended to work, as compared with that other; which I have beheld at work by the hour; not "beating its full," indeed, but to the extent of skewing the heaviest of official wind-sticks hopelessly out of truth, such was its power output. I have also suggested that the Chadderton system might work as a V-type; of which, and also the working of its special pressure controlled dual-purpose valve, I am confident enough.

But if you will notice carefully, I have never actually said that the Chadderton motor, *as a rotary*, did or would work. Or as an *air-cooled* proposition in any shape or form. Both questions are arguable, it seems. And of the latter, I am frankly doubtful. As to the former, let us see.

The Rotary Position: Mechanically.

Regard now that crank-shaft, with its opposed throws, as a fixed affair in the rotary manner. Either throw is eccentric to the common axis of the shaft and crank-chamber—of which the cylinder length is the radius, of course—and doubly so to each other. But both pistons are tied to these throws rigidly, and have only freedom of side-wise motion: so the outer one becomes as it were the cylinder, and the inner, the ordinary piston of, let us say, a Gnôme.

So imagining the firing to have taken place, it is evident that so far from the double-ended explosion shock having any "floating" effect on the crank-shaft—which is the supreme merit of that other design, as a V or a vertical—or being balanced itself—it merely stresses it none too evenly, on all three cranks, half upon the middle one and a quarter to each side one.

Actually, the respective proportions of the shock dispersion are as to half on the crank-shaft and half on the piston heads: that is, a quarter to the middle crank, an eighth to each side one, and a quarter each to the two piston heads.

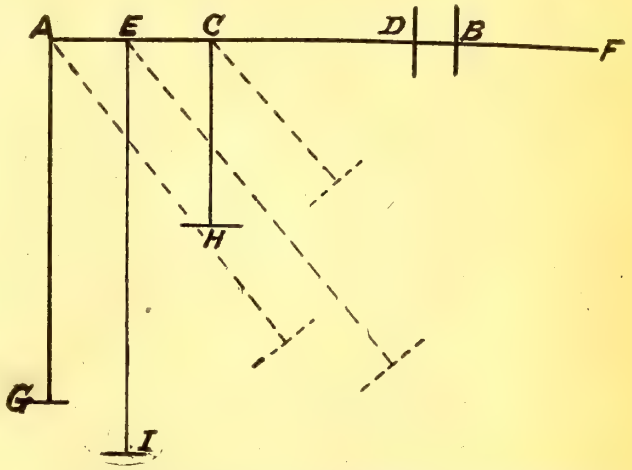
The Proof of Adequate Motion.

But what about the motion part of it? To prove this, it is only necessary to draw a line A B representing the distance between the lower crank-axis and the outer piston head. Then within these points, and on the same line, to mark off a distance corresponding to the length between the upper crank-axis and the inner piston head: as C D. And then likewise on the same line, from a point E—midway between A and C to correspond with the shaft and crank-chamber axis, to continue the line as far as a point F for the cylinder length or radius from E.

Now the particular point to notice is that points D and B—the piston heads—will be comparatively close, as at the instroke of full compression before firing: while B and F, outer piston head and cylinder top, are remote.

Assume then firing to have occurred: and on that assumption form the basic points A, C, and E, and at *right-angles* to the line, draw lines of *equivalent lengths*, A G, C H, and E I.

Now it will be seen that the distance between G and H—representing the piston heads at full outstroke, the distance is now as great as the original distance A C between their respective crank-axes, *plus* their original slight distance D B. Thus proving that motion must have occurred relatively between the piston heads B G, D H. Notice also that the outer piston head as G, is now quite near to the cylinder top I, proving the occurrence of an outstroke to the beginning of the exhaust. So the cylinder must have moved relatively to the outer piston according to schedule, if merely as a container. Drawing still other lines from A, C, and E, at an angle of 45 deg. to the original line, would only show the relative distances between the other ends of those lines to be half of what they were at a rectangle: thus proving the progression of the stroke: and, finally, that there can be no question of the Chadderton motor's mechanical working as a rotary.



A B—Diagrammatic length from crank-pin to piston-head of outer piston at end of instroke.
C D—Diagrammatic length from crank-pin to piston-head of inner piston at end of instroke.
E F—Diagrammatic length from crank-shaft axis to cylinder-head.
A G—Same as A B on outstroke.
C H—Same as C D on outstroke; both showing the new relative distance between the piston-heads G and H (formerly B and D respectively), and both from
E I, towards which G has now approached, and H received from.

The Physical Aspect.

On the other hand, I am inclined to doubt its successful physical working as an air-cooled motor—and, therefore, as a rotary at all—for this reason. It is true that the outer piston head G and the inner one H, during the entire exhaust-stroke, are coming to their original positions B and D: and hence are scavenging the exhaust between them through the valve, effectively enough.

But they are not scavenging it direct into the open—as when the exhaust valve of a Gnome opens—but only into the pot B F. That is to say, into the entire cylinder area, through which the working stroke of the outer piston travels. The surface of this space must therefore be lubricated, yet will be perpetually burnt dry. For note that, whereas in a four-stroke motor during the exhaust stroke, not only the rush of the exhaust gases helps them out into the open air, but the piston is actively pumping them out. Whereas nothing is expelling them from the pot in this case. Therefore, it seems to me that the pot must soon overheat, besides having every vestige of the oil burnt off its walls. Hence I fear, no rotary.

The Preferable Alternatives.

As a water-cooled V-type, or a radial—merely a multiplication of V's—the Chadderton design looks better, since any initial extra heat, due to any lingering of the exhaust in the pot, would be absorbed by the water, and any residual gases would be immediately scavenged from the pot by the next outstroke of the outer piston. And well water-jacketed it would indeed need to be. For notice that the outer piston-head is subjected to exhaust heat during the entire instroke, and to the far greater combustion heat during the whole of the working outstroke. And that only for a fraction of a moment—during the charge injection—does it get a chance to cool. That is to say—taking the speed at 1,200 r.p.m.—during 1/40 of a second or less. instead of the 1/20 or more in the conventional cycles, two or four stroke. I should say that in these circumstances, it is just possible to escape pre-ignition, even during that instantaneous charge-injection. No air can enter the "pot" against the exhaust-flow, so the piston-head cannot suck in air during the instroke; and there is no perpetual flow of cool mixture over its head—as in the other motor already referred to—during the primary induction; because that part of the Chadderton cycle is effected internally, centrally of the motor.

The Conditions: and the Prospect.

One sees, then, how hopeless it is to consider the Chadderton as a rotary proposition, whatever the merits of its design—if modified—in any stationary shape, adequately water-cooled.

Nothing short of that will suffice; for even air-blast cooling through air-jackets would hardly suffice. So one sees, in any case, of what a special metal, with what a low coefficient of expansion must the piston, and particularly that channel valve, need to be made. Also how essential it would be to adhere to the valve-less ideal in all other respects.

Still, all this is merely a statement of the conditions and difficulties of the proposition as they appear to me; not at all saying in the approved official way "the thing cannot be done." Victories that count are won, after all, by forcing an ideal through in spite of difficulties that seem insurmountable. But you must have obtained the most photographic survey of your battle-ground to know precisely what it contains, before you begin fighting. Theoretically, the Chadderton cycle appears to me to possess singular merits, and to have been conceived with exceptional perception of the basic requirements. As a two-stroke proposition, its wagon is hitched to a star. Practically, too, the design displays the greatest promise of achievement, provided that every obscure mechanical obstacle or defect be foreseen and overcome. And, in fine, one may say this, that, given this success, the physical efficiency, heat-engine result, the fuel-economy and the power output should be extraordinary.

The Purpose of the Cycle.

Coming, then, to the actual inspiration and purpose of the Chadderton cycle, as expressed in its charge-injection under pressure, one finds that it is a three-fold one: apart, of course, from its minor aims of cold-gas delivery, shock balance—very questionable, as already explained—a less noisy exhaust, greater flexibility, and less weight. In the first instance, the intention is to provide constant and certain self-starting; a convenience, but not an essential.

The second part of it is to keep the carburation so remote and locked up until the absolute instant of use, that the motor shall not be able to catch fire in any circumstances; for it is to be noted that it does not involve pressure in the petrol-tank in the least. To support this, one does not remember any case of the Antoinette motor—embodying much the same principle—ever taking fire in any of the accidents that befell its death-trap monoplane.

But the third part of the idea is by far the most important from a military standpoint, for it aims at nothing short of the abolition of the roof. Which is the motor's limitation, rather than the plane's. One need not quote any inside facts—incidentally well known to the Huns—and to everybody but ourselves—in support of the statement that the high-speed geared down automobile type of motor is no use at high altitudes, because it chokes to death like a fish out of water, so that you cannot get another 100 revs. out of it, let alone on the propeller; whereas the Huns use a direct-coupled motor with a 1,000 to 2,000 r,p,m, normal and an acceleration—with a consequently direct effect—to 1,600 r.p.m. or better in the thin air.

And its Partial Success. Why?

The Chadderton cycle obviously aims to eliminate this induction choking, with its five-atmosphere-pressure charge injection: and obviously, that principle must succeed to a great extent. Not wholly, as I shall show. But sufficiently to have at once aroused official interest, and immediately active support, instead of evoking nothing more than the official promise "to inspect" when, at the outbreak of war, the whole scheme was laid before both W.O. and Admiralty, and—turned down; although public money by thousands was forthcoming to foster "official" designs.

Yet, why not wholly? For the simple reason of the nature of the air at high altitudes. You cannot work with other than your surrounding element, deficiencies and all, unless you propose to remedy those deficiencies. What those chemical deficiencies are, is no business of mine to discuss. We hear a great deal of the wonderful aeromotor developments that were inspired at Brooklands. So it is a curious coincidence that a little device which was once practised at Brooklands—and forever barred, and so forgotten—should supply the answer and key to the full hundred per cent. of the roof problem so far as the motor is concerned. Which the clever Huns do not yet seem to know, judging from what has not been found on any captured machine. You can get it at most chemists.

(To be continued.)

MARKET REPORTS.

Prices given are for quantities on usual terms.

August 2nd, 1917.

COPPER.—The position in America is still most difficult, and it is hoped that the authorities there will realise that maximum production should now be the goal, prices taking a second place.

If the labour situation does not soon improve it is quite probable that it will have an effect upon prices, as the output has suffered a very serious check. The position here is unaltered, and prices of Ingot Copper remain the same. It will be observed that in consequence of the reduction in the prices of Ingot Copper the prices for Sheets and Tubes have now been adjusted.

Copper Ingot (Standard)	£125 per ton Cash.
Copper Sheets	£160 per ton Cash.
Copper Tubes, S.D.	19¾d. per lb.
Brass Sheets, 24 Gauge	15⅝d. per lb.
Brass Tubes, S.D.	16½d. per lb.

TIN.—The market is a little brighter although prices are again on the upgrade. America is now buying, and the business is likely to increase. There is every indication that the demand for English Tin will continue to improve.

Comparative Prices.

To-day	£246 0 0
July 26th	241 10 0
Last Week	238 15 0
Last Month	245 10 0
Highest Last Year	205 0 0

LEAD.—Prices are still unaltered, and the chief interest centres round supplies. It is gratifying to note that there is sufficient to meet national requirements.

Comparative Prices.

To-day (Official Average)	£30 0 0
Last Year (Official Average)	27 7 6
1915 (Official Average)	23 17 6
Highest Price, 1916	36 10 0

STEEL.—The Steel situation remains the same. Supplies are certainly improving, but there is still an enormous accumulation of orders for Aircraft Steels; furthermore, there will be a colossal increase in the demand, and it will be an impossible task anything like to fulfil the orders unless the authorities quickly arrange for a great increase in the output of Special Aircraft Steels. There are ample supplies of Sheet Steel, but H.S. Steels and Cast Steels are most difficult to procure.

Current Average Prices.

R.A.F. 3B	Steel, 36s. to 40s. per cwt., Basis. (Black or Blue Reeled).
R.A.F. 1E	Steel, 78s. to 80s. per cwt., Basis. (Black or Blue Reeled).
R.A.F. 9A	Sheet Steel, 30s. to 32s. per cwt.

ALUMINIUM.—The position remains unaltered.

Official Prices.

Ingot	£225 per ton.
Remelted	£210 per ton.

TIMBER.—The question of supplies is now being taken up in earnest, but chiefly in unofficial circles. If the production of aeroplanes has to be very considerably increased, then the Timber problem will be the most difficult to solve. The United States have already tackled the situation, and are now carrying out systematic experiments with obtainable woods. Apparently the only way to solve the whole difficulty is to find substitutes. We learn that the Silver Spruce which the Government are supplying to contractors is very unsatisfactory, and if the Mahogany and Walnut is no better, it is more than likely that the whole of the wood will be left on their hands. Prices naturally continue very firm.

Current Average Prices.

Silver Spruce,	17s. 6d., c.f.
English Ash,	13s. 6d. to 15s., c.f.
Walnut,	2s. 3d. to 2s. 6d., s.f.
Mahogany,	2s. 2d. to 2s. 4d., s.f.

Prices are for selection and delivery.

FABRIC.—Supplies are fairly good, but there is still some doubt surrounding the official prices for the 17C Linen Fabric. The price of 2s. 8d., 36 in. wide, is certainly out of all reason, and we are strongly of the opinion that some official has made a serious error.

THE CASE OF AUTOGENOUS WELDING.

By Artifex.

Some months before the war, in the course of a visit to a large firm of motor-carriers, I was shown a large heap of fragments—motorous fragments—in one corner of their garage. "That," said the manager, "is the most expensive exhibit in our show. Guess how much it represents? Just a little over £10,000." Now only a motor-trader or a Bucklersbury financier can talk about such large sums unmoved; to say nothing of their apparent loss. I at least could not, so forthwith examined this Golgotha of uncoined capital in curious detail; only to find, after a mere five minutes' raking, how fully justified is the present phrase "apparent loss." For there was nothing, no two matching bits, that a good autogenous welding plant, handled by a man of experience, could not have converted into a profit: if we may agree to call "profit" that which is represented by the normal working of the efficient machine, or one thus restored to efficiency.

So the newer, truer commercial economics—though one does not remember seeing the matter so sensibly put before—really amount to this, that there is no actual wealth in raw material *per se*, not even in all the idle gold in any bank: but only in the judicious employment thereof. Which is just another way of saying, in the experience that belongs: the super-efficiency which spells success being merely experience sublimated into a fine art.

Here, for instance, are the tubes of paint. There—no doubt they might have been better used—is this year's Academy: or better still—any motor-trader could say—a fine carriage panel. Here are the steel blooms, the ingots of bronze; there the £1,000 motor-car. What is the magic that has translated the one into the other? Nothing but experience.

Somewhere then, in the dim offing of comprehension, arrives the case of the autogenous welding-plant.

Surveying that scrap-heap and all its forsaken possibilities, between whiffs, I proceeded to set forth the foregoing facts; not so ornately, but in those plain, Saxon pavement-phrases most suited to the managerial hide. His reply, as to the employment of such a repair-plant, was likewise "Not——likely!"

"Here," one thought, "is the rare wise man who knows not, and knows that he knows not"; but far from embracing him as the proverb recommends, I assailed him in still more vigorous language for his reasons, since it is only in the seat of the foolish that one can gain true instruction on any matter. They came—sorted and washed of their colour—to the effect that "surely nobody thought it would pay him to keep an incarnadined blow-pipe fakir loafing about the place at three quid a week waiting for accidents that weren't supposed to happen. Or did anyone imagine that any of the fitters, or the yard man, could handle the plant in his spare time? For if so, he knew better than to ask for more trouble in that way. No, that was what the scrap-heap was used for, in his business as a crimson common carrier. He believed in getting new parts right away, to save time and give the insurance company a chance to make good. But wasn't that scrap-heap enough to drive any man to drink?" It was; or did.

Such is the wisdom of the practical man, whose practice is the eternal compromise of the imperfect, for he is the beaver who just *has* to climb the tree of commercial solvency. There, at least, however, was the appreciation of the wage-worth of experience, and the utter fatuity of employing anything else. Yet coupled, as usual, with the inability to see round his immediate troubles. But, from the detached onlooker's standpoint, there was the fact of the scrap-heap, as proof that accidents do happen; and will, whether "supposed to" or not. Also, its merciless reduction of ten thousand good sovereigns to a fiver's worth of scrap metal. There surely must be some alternative. There is, actually. What man, who, after great adventure, has ever lain face downwards for urgent hindward patchings, will deny the greater economy—to say nothing of quicker freedom for new excursions—of sound repairs executed by a specialist. Given these, no insurance for his penny. It is only in after life that such delusions crowd upon us to cloud the sane judgment of seven years. And losing our imagination of the Ought-to-Be, we no longer strive to make it come true.

That is why, in the case of autogenous welding, while we rightly decline to trust its results in casual hands, we do not see that the more we believe in its possibilities, the more we shall encourage specialism to make a business of the work, because of the livelihood offered by the amount of the work thus made available. There is assuredly no branch of constructive craftsmanship less overcrowded at present; equally none, of which the products are more in demand—almost essential demand—in motor-car and aeroplane engineering, quite apart from actual repair work. That is to say, IF they are reliable.

Yet to assure reliability—which is only to ensure an extraordinary margin of safety—there must be a long apprenticeship to the work even when allied to the keenest intelligence and natural aptitude on the part of the practitioner. Not only must theory be studied assiduously—any amount of it, as anyone with the slightest knowledge of metallurgy or chemistry will readily understand—but all the theory on the subject in existence is utterly useless if not simultaneously accompanied by actual hand-practice. Consequently, it is not only from the workshops of a firm that specialises in autogenous welding that we can expect to see reliable work turned out, but it is only there that learners, by seeing examples of such work and the craft-practice of the oldest hands, can form their own standards, and expect to become equally proficient. There are, it is said, tricks in all trades. In autogenous welding, however, there are none in the ordinary sense of trickwork—which, in this case, only means slumming a job—but there are numberless "turns" of practice, apparent mysteries, to be personally solved under the guidance of older hands; judgments and appreciations to be formed as to the nature of any one of a hundred given jobs; in all of which precision and certainty—which are essential to turning out reliable work—can only be acquired by personal experience. Obviously, it is only such firms that can constitute anything like a nucleus of craftmanship and of reliable hands. Just as obviously, it is vain to look for them elsewhere. Occasionally, the self-taught genius may occur: but in ninety-nine cases out of a hundred, the self-taught man will have to unlearn most of his practice.

(To be continued.)

DESIGN AND PRODUCTION OF AIRCRAFT IN WARTIME.

By Wing Commander J. W. Seddon, R.N.

Reproduced from "Automobile Topics," New York, June 30th.

One of the proved facts of aerial warfare is that the command of the air rests very largely, indeed, with the side producing the best single-seated fighter, provided it is produced and used in sufficient quantity, and the Allies are devoting particular attention to the improvement of this type. Hitherto popular designs have survived on the Western front from three months to a year; those lasting for a year have always overstayed their welcome, and it is probable that the period of the single-seater fighting plane in the future will be not more than six months because this is sufficient time to permit the enemy to obtain all information about a given model and copy or improve it. The same line of progress applies to other types, but to a much less extent.

It is clear that the designer, particularly of the small fighting aeroplane, whether in France, Great Britain, or America, is always confronted with the problem of designing a type that is an advance on any contemporary machine of a similar type. A machine can be an advance on a similar type in one of two main respects: (a) Because it possesses a better performance. (b) Because its fighting facilities are better. Each of these main headings includes a number of subdivisions; thus better performance may mean better climbing only or better speed only or greater endurance or any combination of these, while better fighting facilities may mean better manœuvring capacity or better view or better positions for guns or improved weapons or any combination of these.

The design of a new type involves procedure along one of the following general lines: (1) Increase the horse-power weight ratio; (2) decrease the wing or structure resistance; (3) devise a new arrangement of the supporting planes with regard to the position of pilot or crew. After enlarging somewhat upon the methods to be followed, the author returns to the subject of wind resistance, and points out that wing resistance has been notably reduced by the employment of low resistance aerofoils and by the proper shaping of wing tips. Wind-tunnel research has given a good range of aerofoils varying from the low resistance type carrying about 5 lbs. per square foot at 45 miles per hour at its maximum lift angle to the high-lift aerofoil which carries 7½ lbs. per square foot under the same conditions. When the minimum speed is specified if the aerofoil carrying 7½ lbs. is utilised in place of that carrying only 5 lbs., both at the usually specified speed of 45 miles per hour, there will be a large saving in area, and consequently in weight by using the high-lift variety. The weight-saving extends to the whole plane, and is roughly approximated at 1½ lbs. per square foot of area saved, which materially increase the horse-power weight ratio in favour of the high lift machine. Improvement is also obtained in ease of handling and in view. The author then points out the limitations that restrict high-lift design, and states that it is quite possible that the super-scout of the near future with a low resistance type aerofoil will have a speed range of 50 to 150 miles an hour, while the same machine with a medium lift type curve would probably achieve 50 to 125 miles an hour, and with the highest lift aerofoil 50 to 100 miles per hour only. The point is brought out that while excess horse-power is of value in the low resistance aerofoil it becomes increasingly wasteful as the lift is increased.

It is most desirable that designers in this country (U.S.A.) be encouraged to compete in the race of producing the best fighting scout. Ultimate judgment is in the hands of the pilots who demand the best and the best only.

THE PATENTS INDEX.

The subjoined list of recent inventions has been specially compiled by The Aeroplane from the current Official Patents Records.

Patent Applications.

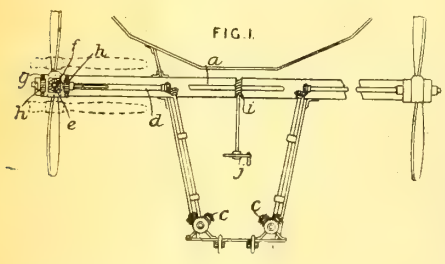
Aeronautical Instrument Co. Balloons. No. 10819. July 27th.
Aeronautical Instrument Co. Elastic seatings for valves of balloons and airships. No. 10826. July 27th.
Beardmore, G. F. Carburettors for aviation engines, etc. No. 10672. July 25th.
Broughton, P. Delves-. System of petrol-feed for aeroplanes. No. 10553. July 23rd.
Broughton, P. Delves-. Magnetic drive for petrol pumps for aeroplanes. No. 10813. July 27th.
Cowtan, D M. Light construction in metal for aircraft, etc. No. 10671. July 25th.
Crowe, S. Metal construction of aircraft. No. 10736. July 26th.
Dickson, H. C. Tubes, struts, stays, etc., of aircraft. No. 10564. July 23rd.
Edwards, E. A. Aircraft. No. 10791. July 27th.
Elgie, G. Aeroplanes. No. 10743. July 26th.
Ellis, F. A. Screw propellers for aircraft. No. 10795. July 27th.
Green, W. N. Gauge or indicator for registering when bullet, etc., enters petrol, etc., tank, and safety-valve combined. No. 10647. July 24th.
Guise, H. J. Airships. No. 10878. July 28th.
Johnson, V. Device for instantaneous discharge of petrol tanks on aircraft. No. 10728. July 26th.
Lamblin, L. Heavier-than-air flying-machines. No. 10831. July 27th.
Leyland Motors, Ltd. Internal-combustion engines for aircraft, etc. No. 10650. July 24th.
Litchfield, W. G. Apparatus for steering aircraft. No. 10783. July 27th.
Macy, A. J. Aeroplane controlling and stabilising device. No. 10600. July 23rd.
Macy, A. J. Stabilising control for aeroplanes. No. 10601. July 23rd.
Ottino, G. P. Aeronautical machines. No. 10758. July 26th.
Phillips, H. Aeronautical machines. No. 10747 July 26th.
Smith, R. J. Device for destroying aircraft. No. 10538. July 23rd.
Welsh, J. Aerial shrapnel and bomb-dropping gun. No. 10533. July 23rd.
Williams, A. H. Internal combustion-engines for aero-engines, etc. No. 10790. July 27th.

Complete Specifications Accepted, Prints of which are obtainable on and after August 16th, 1917.

100,455. May 12th, 1915. Antoni, G. and U. Aeroplanes.
108,047. August 14th, 1916. Money, G. J. Depth-finder or sounding apparatus for travelling aircraft.
108,057. August 24th, 1916. Apparatus to deliver objects from one aircraft to another while in motion.

Abridgments of recently published Specifications.

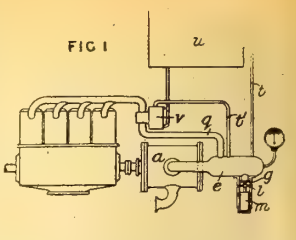
106,612. Aeronautics. Mary A. C., 27, Cours Lieutand, Marseilles, France. Not yet accepted. Abridged as open to inspection under Sect. 91 of the Act.



Propelling; Steering.— Relates to aerial screw propellers for a dirigible balloon, the shafts of which are adapted to be turned through 180 degrees in a vertical or horizontal plane. Fig. 1 shows two propellers mounted on rotary caps *f* carried by a transverse girder *a*, the flanges *g* of the caps being toothed to engage pinions *h* on a transverse shaft having a worm-wheel *i* engaged by a worm on a shaft provided with a hand-wheel *j*. The propellers are driven through gears *e* from horizontal shafts *d*, which are geared, as shown, to engines *c* on the car. A propeller-shaft adapted to be turned through an angle in an horizontal plane is used at the front and rear of the dirigible, the rotary caps corresponding to the caps *f* being turned by tubular members concentric with vertical driving-shafts.

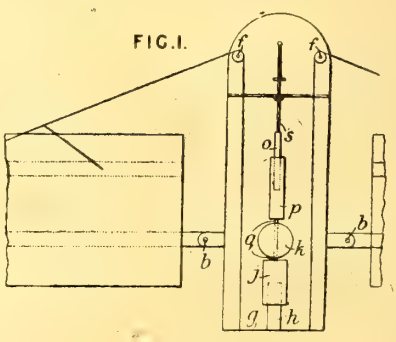
106,635. Internal-combustion engines. Watson, H., 38, Marlborough Road, Wimbledon Park, Hay, J., 159, Castellain Mansions, Maida Vale, and Jonques, L. A., Hythe Road, Willesden Junction, all in London.

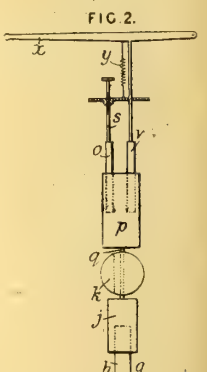
Reservoir Pressure, Regulating; Driving-gear; Pumps; Carburetting.—Engines are supplied with air at sea-level pressure independently of the altitude at which they work, by means of apparatus comprising a pump *a* which will deliver sufficient air at the highest altitude and a reservoir *e* with a safety-valve *g* which is loaded and balanced by a cylinder *m* and piston of the same area as the valve and containing air at sea-level density and apparatus *l* to compensate for variation in the length of the valve spindle under varying temperatures. Expansible chambers filled with air and springs may take the place of the cylinder and piston; or the valve may be loaded by a spring which is adjustable by hand to a pressure gauge. The petrol tank *u* and float chamber *v* are connected to the air reservoir by pipes *t*, *t*¹, and the induction pipe *q* may be fitted with a sliding valve which will allow the engine to draw air directly from the atmosphere, in case of a breakdown of the pump. The Provisional Specification also states that the air may enter the chamber through a funnel facing in the direction of movement, that the pump may be driven by variable-speed gear controlled by an aneroid, and that the air chamber may be heated by the exhaust.



106,639. Aeronautics. McGregor, G. S., Fort Grange, Gosport, Hampshire.

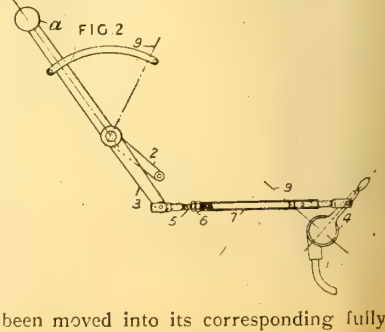
Steering and Balancing.—For steering and balancing an aeroplane in a vertical plane, the wings are adapted to be swung longitudinally against the elastic pressure of pneumatic cushions. Fig. 1 shows an aeroplane in plan having its rear spars pivoted at *b* to the frame. The front edges of the wings are connected by cords led over pulleys *f* to a cross-piece *g* carried by the plunger *h* of a cylinder *j* containing oil or glycerine, etc. The cylinder *j* communicates through a pipe *q* with a chamber *k* having an air space which constitutes the elastic cushion resisting backward movement of the wings under wind pressure. The pipe *q* is continued to a second chamber *p*, in which two plungers *o*, *v*, Fig. 2, are provided. The plunger *o* is moved by a screwed spindle *s* to effect adjustment of the system, and for setting the machine in a desired altitude, and the plunger *v* is moved by a hand-lever *x* for ordinary control. A spring *y* normally balances the pressure of the plunger *v* on the hand-lever. A modification is described in which the front spars of the wings are pivoted, the rear spars being connected to plungers working in a single transverse cylinder. The control may act upon the cables instead of on an auxiliary plunger.





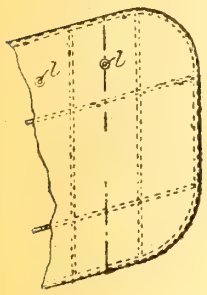
106,744. Internal-combustion engines. Butler, L. F G. and Brazil, Straker, & Co., Motor Works, Fishponds, Bristol.

Regulating.—Control mechanism, particularly adapted for the engines of aircraft, comprises means by which the throttle valve and the fuel-supply valve or the supplementary-air valve are opened independently, the backward movement of the throttle-valve lever returning the air-valve or the fuel valve to a closed or predetermined position. In the arrangement shown in Fig. 2, a lever *a* has an arm 2 connected to the throttle-valve, and an arm 3 carrying a rod 5 which slides freely in a tube 7 connected to the supplementary-air valve or fuel-valve lever 4, which may be moved into its fully open position 9 after the throttle-valve lever *a* has been moved into its corresponding fully



open position. The closing movement of the lever *a* brings a nut 6 into contact with the tube 7 and returns the lever 4, thus shutting off the supplementary air or fuel supplies. A modification is described in which the control levers are adjacent; in returning, a projection on the throttle-valve lever engages the other lever and moves it into its closed position.

FIG 2



106,645. Aeronautics. Quick, W. B., "Belmont," Station Road, Wootton, Isle of Wight.

Planes, Construction of; Aerostats.—The whole extent of the planes of aeroplanes and seaplanes is divided into a number of spaces containing air-tight containers adapted to be inflated with air, hydrogen, or other gas to render the planes more buoyant. The containers have each a nozzle *l* and a valve by means of which they are inflated separately or by a common supply pipe.

WORKMEN'S UNEMPLOYMENT INSURANCE.

HOW TO OBTAIN A REFUND OF A PORTION OF THE EMPLOYER'S CONTRIBUTIONS.

By T. Kemp Walton, A.C.I.S.

Section 94 of the National Insurance Act, 1911, as amended by Section 5 of the National Insurance (Part II Amendment) Act, provides for certain refunds to the employer of a portion of the amount he contributes to the National Insurance Fund by the affixing weekly of Unemployment stamps to his employees' Unemployment Books, and as there are now in the Aircraft Industry many employers whose workers were not prior to the outbreak of war in an insured trade, but who now, owing to being engaged on a different class of work, have to contribute to the Unemployment Fund, it is hoped that the following notes will be of assistance by explaining how such refunds may be obtained.

The Act stipulates that the Board of Trade shall, on the application of any employer made in the prescribed manner within two months after the termination of an Insurance Year, refund to such employer as soon as practicable out of the Unemployment Fund the sum of three shillings in respect of each workman in respect of whom he has paid not less than forty-five contributions.

The Insurance Year is the period of not more than fifty-three weeks, which ends on the Saturday nearest the 14th July in any year. As this year the 14th July falls on a Saturday, it is upon this date that the 1916-1917 Insurance Year ends, and claims must, therefore, be submitted before 14th September next, otherwise they will not be considered.

Claims can be only in respect of the period since 16th July, 1916, as applications for refunds for the year preceding this date had to be sent in before 15th September, 1916.

A "Contribution" is considered as 2½d., and it, therefore, follows that to the Unemployment Book of each worker included in the claim not less than forty-five fivepenny stamps must have been affixed during the Insurance Year, or the equivalent of that number may be made up by stamps of other denominations, a fourpenny stamp being four-fifths and a twopenny stamp two-fifths of a contribution.

The application for refund must be worded in the manner set out in the first schedule of the Unemployment Insurance (Refunds to Employers) Regulations, 1915—Statutory Rules and Orders, 1915, No. 514, and which is as follows:—

NATIONAL INSURANCE ACTS, 1911 TO 1915, UNEMPLOYMENT INSURANCE.

Application by Employer for Refund under Section 94 as amended.

I (We), the undersigned, hereby apply to the Board of Trade for a refund as set out below in respect of the workmen whose names are set out in the Schedule(s) annexed hereto; and I (we) hereby certify:—

(1) That not less than forty-five contributions (otherwise than by virtue of the last sub-section of Section 5 of the National Insurance (Part II Amendment) Act, 1914, have been paid by me (us) during the insurance year ending on in respect of each of the workmen whose names are set out in the First Schedule annexed to this application, and

(2) That not less than forty-five contributions by virtue of the last sub-section of Section 5 of the National Insurance (Part II Amendment) Act, 1914, have been paid by me (us) during the insurance year ending in respect of each of the workmen whose names are set out in the Second Schedule annexed to this application; and

(3) That the particulars set out below and in the Schedules annexed to this application are to the best of my (our) knowledge true and accurate, and are in accordance with the records contained in my (our) books of account.

Date ..... Signature of Applicant .....

Particulars.

Full name and address of employer. .....

Business of employer. .....

Day of week:—
(a) on which wages are paid .....
(b) up to which wages are paid. .....

Has the employer had an arrangement with the Board of Trade during the insurance year for stamping at extended intervals, or for stamping in the week after payment of wages? If so, give particulars. .....

Number of workmen in respect of whom application is made. First Schedule. Second Schedule.

Amount of refund claimed. First Schedule. Second Schedule.

Total amount of refund claimed. £ : :

This must be accompanied with a statement (in duplicate), giving the number of each worker's Unemployment Book and the letters appearing thereon indicating the Division to which the Book belongs, and the surnames and initials of the workers.

These particulars are usually given in the following form:—

Name of employer .....

First Schedule—Particulars of Claim.

Employer's Distinguishing Nos. of Worker.	Name of Worker.		Unemployment Book.	
	Initials.	Surname.	No. of Book.	Division.

It is not necessary to show the number or value of stamps affixed to each book, as only men in respect of whom not less than forty-five contributions each have been paid should be included, and the amount of refund is fixed, viz.:—three shilling each person.

It will be noted that the prescribed form of application set out above refers to amount of refund claimed under First Schedule and Second Schedule.

The First Schedule is that illustrated, while the Second Schedule is for particulars of men in respect of whom refund is claimed at a reduced rate. As the reduced rate is allowed only in exceptional circumstances, i.e., where employers and employed have been exempted during the insurance year from paying full contributions owing to working systematically short time; and where men have been absent while training with the Territorial Force or Naval, or Army Reserve, neither of which circumstances now operate, owing to the war, the Second Schedule can be ignored except by those employers who have an arrangement under Section 99 of the Act whereby the Unemployment Books of their workers are stamped by the Labour Exchange, and not by their own Wages Department, and, even in this case, it will not be necessary to submit the Second Schedule if at least forty-five contributions of 2½d. have been paid by the employer in respect of each man.

As many employers do not enter upon their records the numbers and letters appearing on the Unemployment Books, it is essential, if the employer wishes his claim to be considered, that this information be noted before the 1916-1917 books, which expire on the 14th July, 1917, are returned to the workmen or to the Labour Exchange.

When completed, the applications must be sent to the local Labour Exchange, or to the Controller, Claims and Record Office (Minister of Labour), Unemployment Insurance, London, S.W.1. The claim will be acknowledged, and, in the ordinary course, the application being in order, the employer will receive a remittance for the refund a few months later.

(*Continued from page 372.*)

Temp. Proby. Observer Officer G. H. Millar promoted to temp. Observer Lt., with seny. June 17th.

AUGUST 7th.—Flt. Comdr.—R. B. Ward, reapptd. as Act. Sqdn. Comdr., seny. July 26th.

Flt. Lts.—C. Murray and J. Forgon-Potts, reapptd. as Act. Flt. Comdrs., seny. July 26th.

Temp. commissions as Lt. (R.N.V.R.) have been granted to the undermentioned, seny. as stated:—J. Sydenham (P.O.), August 2nd; M. G. Jones, J. G. Levy (A.C., 1), and F. J. Todd, August 4th.

THE CASUALTY LIST.

Reported Aug. 1st.

ACCIDENTALLY KILLED.—Denholm, Prob. Flt. Officer R. M., R.N.

MISSING, BELIEVED KILLED.—Chadwick, Actg. Flt. Comdr. A. J., R.N.
Roach, Flt. Sub-Lt. G., R.N.

WOUNDED.—Forman, Flt. Sub-Lt. J. H., R.N.

ACCIDENTALLY KILLED.—Collins, M. G., P.O. Mech., F.4670.
Lightstone, S., Aircraftsman, 2nd Gde., F.15791.

DIED OF WOUNDS.—Allen, W., Air Mech., 1st Gde., F.1053.

DROWNED.—Tunnard, J. H., P.O. Mech., F.6012.

Reported August 2nd.

MISSING.—Reid, Flt. Sub-Lt. E. V., R.N.
Austen, Flt. Sub-Lt. V. G., R.N.

SLIGHTLY INJURED.—Luckham, Flt. Sub-Lt. P. F. T., R.N.

Reported August 3rd.

PREVIOUSLY REPORTED MISSING (BELIEVED PRISONER), NOW OFFICIALLY REPORTED PRISONER IN GERMANY.—Paine, Flt. Sub-Lt. Leo P., D.S.C., R.N.

Reported August 4th.

MISSING.—Richardson, Flt. Lt. (Lt., R.N.R.) W. H., R.N.
Allaway, Flt. Sub-Lt. W., R.N.

PERSONAL NOTICES.

DEATH.

DENHOLM.—At an inquest on the body of Robert Miller Denholm, aged 18, a young aviator, of Greenock, who was killed while flying over Essex, it was stated that a wing of his aeroplane collapsed in mid-air, and the aviator was thrown from the machine.

MARRIAGE.

COPE—ROBINSON.—The wedding took place at Datchet parish church on August 1st, of Flt. Lt. T. L. Cope, R.N., son of the late Mr. Thomas Cope and Mrs. Gardiner, and the Hon. Norah Robinson, eldest daughter of Lord and Lady Rosmead, of Westfields, Datchet. Flt. Lt. Cope is well known as a member of Sir Ernest Shackleton's Expedition to the South Pole. On returning from the expedition Mr. Cope at once got a commission in the R.N.A.S. The bride has only recently returned from working in a French hospital, and was back on short leave when the marriage was arranged. The wedding ceremony was performed by the Rev. Canon Edgar Sheppard, Sub-Dean of the Chapels Royal, assisted by the Rev. J. H. Davis, of St. Mary's, Datchet. The bride was attended by Miss Diana Knight (her cousin). The best man was Mr. R. Pines.

Rules have been issued by the Commissioners of the Admiralty for securing the safety of airship and kite-balloon stations under their control. These forbid smoking, except as authorised by the officer in charge; and the taking into any danger building or danger area of tobacco or any contrivance for smoking, or of any matches or lights, except as authorised. Police officers are given the right to search anyone entering or in the station, and the entry of any person in a state of intoxication is forbidden.

MILITARY.

G.H.Q. COMMUNIQUÉS.

AUGUST 1st, 10.10 p.m.—Yesterday, in spite of weather which made flying almost impossible, our aeroplanes kept contact with our advancing infantry throughout the day.

The enemy's aerodromes, transport, and infantry were also successfully attacked with bombs and machine-gun fire.

The few enemy machines that attempted to fly were attacked, and six of them were brought down.

Three of our machines are missing.

AUGUST 6th, 9.6 p.m.—Yesterday, after several days of inactivity due to unfavourable weather, our aeroplanes were again able to carry out successful bombing raids and other work.

In air fighting, five German aeroplanes were brought down, one of which was forced to land behind our lines, and three others were driven down out of control.

One of our machines is missing.

WAR OFFICE COMMUNIQUÉ.

AUG. 2nd.—The G.O.C. the British Forces in Macedonia reports:—

Our aeroplanes have bombed hostile camps and dumps at various points north of Seres, between Lake Butkova and the Rupel Pass and east of Petric (all places east of Struma).

THE CASUALTY LIST.

Reported Aug. 1st.

MISSING.—Rook, Sec. Lt. F. W., R.F.C.
Smith, Sec. Lt. W. C., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED OF WOUNDS WHILST PRISONERS IN GERMAN HANDS.—Curphey, Capt. W. G. S., M.C., R.F.C.
Sloan, Sec. Lt. C. R., R.F.C.

Reported Aug. 2nd.

KILLED.—Hartley, Sec. Lt. J. H., R. Mun. Fus., attd. R.F.C.
Noakes, Sec. Lt. H. T., R.F.C.
Riggs, Sec. Lt. R. R., R.F.C.

WOUNDED.—Greenslade, Capt. A. A., S. Lanc. R., attd. R.F.C.
Humphrey, Sec. Lt. E. G., S. Staff. R., attd. R.F.C.
Pantlin, Lt. C. W. R., M.C., R.F.C.
Parsons, Sec. Lt. L. W. B., R.F.C.
Snow, Capt. W. R., M.C., R.F.C.
Young, Capt. W. E., Dorset R., attd. R.F.C.

MISSING.—Bond, Lt. W. A., M.C., K.O.Y.L.I., attd. R.F.C.
Brown, Sec. Lt. S. F., R.F.C.
Cock, Capt. G. H., M.C., R.F.C.
Hayes, Sec. Lt. R., R.F.C.
Messervy, Capt. E. D., Lond. R. and R.F.C.
Moore, Lt. M., Y. and L. R., attd. R.F.C.

KILLED.—R.F.C.—Jones, 43685 2nd Cl. Air Mech. C. (Lewisham, S.E.).

INDIAN FORCES.—MISSING.—Deakin, Sec. Lt. R. H., Inf., attd. R.F.C.

CANADIAN CONTINGENT.—KILLED.—Madill, Lt. R. MacK., Alta. R., attd. R.F.C.

Reported August 3rd.

KILLED.—Briscoe, Lt. M. W., R.F.A., attd. R.F.C.
Burt, Lt. O. L., R.F.C.
Felts, Sec. Lt. P. C., R.F.C.
Thomas, Capt. R. N., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Sinclair, Lt. D. M. F., R.F.C.

DIED.—Clifton, Sec. Lt. G. L. C., R.F.C.

WOUNDED.—Davidson, Sec. Lt. A. G., Gord. Highrs. and R.F.C.
Hall, Capt. R. W. P., R.F.A. and R.F.C.
Keddie, Sec. Lt. F. W., R.F.C.
Maudsley, Sec. Lt. J. B., R.F.C.
O'Neill, Sec. Lt. T. M., R.F.C.
Way, Sec. Lt. G. B. C., S. Lan. R., attd. R.F.C.

CANADIAN CONTINGENT.—WOUNDED.—Reid, Lt. J. H., Que. R., attd. R.F.C.

MISSING.—Smith, Lt. B. H., N.S. R., attd. R.F.C.

Reported August 4th.

KILLED.—Norris, Sec. Lt. H. A. B., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Byrne, Sec. Lt. E., Gord. Highrs. and R.F.C.

WOUNDED.—Knowles, Sec. Lt. C., R.F.C.
Langlands, Sec. Lt. D., R.F.C.
Lewis, Sec. Lt. S. V. R., R.F.C.
Macfarlane, Sec. Lt. R. S., Gord. High. and R.F.C.
Manley, Lt. F., C. C., R.F.C.
Morgan, Sec. Lt. A., R.F.C.
Smart, Sec. Lt. E. J., R.F.C.
Spencer, Lt. G. R., Lan. Fus., attd. R.F.C.

MISSING.—Hill, Sec. Lt. A. B., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Butler, Sec. Lt. L., K.O.Y.L.I. and R.F.C.

AUSTRALIAN FORCE.—WOUNDED.—Mowle, Sec. Lt. A. W., F.C.

NEWFOUNDLAND CONTINGENT.—PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Blackall, Sec. Lt. J. F. W., Newf. Regt., attd. R.F.C.

Reported August 6th.

KILLED.—Tiddy, Sec. Lt. H. K. P., R.F.C.

DIED OF WOUNDS.—Morgan, Sec. Lt. R. C. W., S. Wales Bord., attd. R.F.C.

PREVIOUSLY REPORTED WOUNDED, NOW REPORTED DIED OF WOUNDS.—Stevens, Sec. Lt. J. M. S. G., R.F.C.

DIED.—Samuels, Sec. Lt. W. T., R.F.C.
Ward, Sec. Lt. A. D. W., R. W. Surr. R.
Welch, Lt. S. L. B., R. War. R.

WOUNDED.—Brown, Sec. Lt. J. R., M.C., High. L.I. and R.F.C.
Glover, Sec. Lt. D. S., S. Staff R., attd. R.F.C.
Perram, Sec. Lt. W. H. St. J., R.F.C.
Pym, Lt. A. C. M., Lancers, attd. R.F.C.
Wood, Sec. Lt. G. A., R.F.C.

MISSING.—Curtis, Sec. Lt. H. N., R.F.C.
Prothero, Capt. P. B., Arg. and Suth'd. High., attd. R.F.C.
Tapp, Lt. H. D., R.E. and R.F.C.
PREVIOUSLY REPORTED WOUNDED AND PRISONER, NOW REPORTED DIED OF WOUNDS AS PRISONER IN TURKISH HANDS.—Maguire, Sec. Lt. M. L., M.C., Conn. Rang., attd. R.F.C.
PREVIOUSLY REPORTED PRISONERS, NOW REPORTED WOUNDED AND PRISONERS IN GERMAN HANDS.—Kaizer, Sec. Lt. M. M., R.F.C.
Moody, Sec. Lt. B. C., London Regt. and R.F.C.
PREVIOUSLY REPORTED KILLED, NOW REPORTED PRISONER IN GERMAN HANDS.—Ingle, Sec. Lt. A., North'd. Fus.
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—MacGown, Lt. J. C., Yeo. and R.F.C.
Kerr, Sec. Lt. S. J., North'd Fus.
Roberts, Lt. R. M., K.O.Y.L.I., attd. R.F.C.
Sanders, Sec. Lt. H. W., Mx. R.
Woolcott, Sec. Lt. R., E. Yorks R.
DIED OF WOUNDS.—R.F.C.—Hall, 58169 Sec. Cl. Air Mech. H. F. (Herne Hill, S.E.).
McNicoll, 8870 1st Cl. Air Mech. A. (Palmer's Green, N.).

PERSONAL NOTICES.

DEATHS.

AIRTH.—Lt. Rennie Alexander Airth, Bedfordshire Regt., attached R.F.C., who was killed on active service on July 29th, was the beloved elder son of Mr. and Mrs. George Rennie Airth. He was 23 years old.

BLACKBURN.—Lt. Harry Dudley Blackburn, Royal Berkshire Regt., attached R.F.C. (previously reported missing on April 5th, now reported killed on that date), was the son of the late Henry Bingham Blackburn and Mrs. Henry Bingham Blackburn, of Danehurst, Eastbourne. He was educated at St. Augustins, and Hill Brow, Eastbourne, and at Wellington (Mr. Bevor's House). On the outbreak of war he joined the Artists Rifles, and served with them at home and in France for over 10 months, when he accepted a commission in the Royal Berkshire Regt., with whom he saw a good deal of fighting till he was invalided home. He joined the R.F.C. later, and went out again to France as an observer with his squadron on January 13th. He obtained his "wings" a few weeks before he was killed.

CONRAN.—Major Owen Mostyn Conran, R.F.C. and "King's Own" Regt., and late attached Egyptian Army, who was killed on a night bombing expedition on July 28th, was the son of the late Major Conran and of Mrs. Conran, Brondyffryn, Denbigh. He was 36 years of age.

CURPHEY.—Capt. W. G. S. Curphey, M.C., R.F.C., son of W. S. Curphey, Local Government Board, Whitehall, and 87, Canfield Gardens, Hampstead, was reported as missing on May 14th. News has subsequently been received that he died on the following day in a German field hospital at Bouchain. He was 21 years of age.

Educated at Glasgow Academy and at University College School, London, he joined the Royal Berkshire Regt. in 1914, transferring to the R.F.C. in 1916, in which year he was awarded the Military Cross.

The "London Gazette" of Nov. 19th stated: "He brought down an enemy machine, and two days later attacked and brought down another. He has frequently attacked formations of hostile aircraft and brought them down." In February he was awarded a bar to his M.C. The "London Gazette" of March 12th stated: "He, with a patrol of four machines, attacked a hostile formation of 10 machines. After a prolonged fight he drove one enemy machine down. Later, although wounded, he again led another attack on a hostile machine, and succeeded in bringing it down. He has on many previous occasions done fine work."

His Commanding Officer writes: "He is a very great loss to the squadron, in which he was absolutely adored by officers and men alike, and the R.F.C. loses one of its most capable, gallant, and valuable members."

ELLIS.—Mr. George Ronald Ellis, R.F.C., who died on July 26th as the result of a flying accident in Scotland, was the eldest son of Mr. and Mrs. George Ellis, "Easthorpe," Mirfield, Yorkshire.

FITZGERALD.—Sec. Lt. William Wilks FitzGerald, R.F.C. (killed in action on July 27th), was 22 years of age, and the only son of Mr. and Mrs. M. F. FitzGerald, of Fairholme, Kill-o'-the-Grange, County Dublin. He received his commission in Sept., 1916, and was an observer in the R.F.C.

HART-DAIVES.—Lt. Ivan Beaclerk Hart-Davies, R.F.C., whose death was recorded last week, was educated at a school at Maidenhead and at King's School, Canterbury, and began life as a schoolmaster at New Beacon, Sevenoaks. Afterwards, however, he worked up a wide life insurance and motor insurance business in the Midlands.

He held the "end-to-end" "record" for motor-cycles and light cars, and in 1913, with three other motor-cyclists, won the Mürren Cup, though none of the four had done any bobsleighing before.

A brother officer writes:—"A gallant fellow whom we all liked immensely, and are deeply grieved that he should have been fatally injured when he so much wished to go to France, where, doubtless, he would have won honours."

JAMES.—Lt. James, attached R.F.C., a Canadian officer, was killed on August 3rd owing to his aeroplane falling near Brooklands. Mr. James was born in Canada, and it is not yet known whether he had any relatives in this country.

A verdict of death by misadventure was returned at the inquest on August 6th.

Capt. Fuller, R.F.C., stated that when at a height of 150 ft. deceased seemed to get into trouble. The machine swung to the right and then nose-dived to the earth. Other evidence was given that deceased died two hours after the accident (without having recovered consciousness), from fracture of the skull. Deceased was an expert pilot and was learning artillery observation work.

LOVELL.—Sec. Lt. William Leslie Lovell, Royal West Kent Regt., attached R.F.C. (killed in action on July 27th), was 21 years of age, and the only son of Mr. and Mrs. Edgar Lovell, of The Gables, Cheyne Walk, Croydon. He had his commission in the West Kents in October, 1916, and, joining the R.F.C., was given his "wings" in April of this year.

McPHERSON.—Sec. Lt. Leonard Alfred McPherson, R.F.C., who was reported missing, and later killed, on July 28th, was 19 years of age, and was the eldest son of Mr. A. McPherson, late principal of the Printing Office, Bank of England, and Mrs. McPherson, of 203, Rosendale Road, West Dulwich. He was educated at Dulwich College, where he held the rank of Colour Sergeant in the O.T.C. He left Dulwich in July, 1915, when he was 17 years of age, and joined the Inns of Court O.T.C., being gazetted to a commission in the R.F.C. in January of this year. He obtained his wings and left England for the front early in May.

His commanding officer writes:—"I have lost a most promising and brave young pilot, who already had done much valuable work for his 'side.' He met his death with an aerial gunner on the evening of July 28th. He must have seen some enemy troops on the road, and came down low in order to fire on them with his machine-gun. In doing this brave act he was evidently fired on from the ground, and must have been killed instantly. The machine came down in No Man's Land, and the bodies were recovered with difficulty. . . He died like a gallant English gentleman in the execution of his duty."

MORGAN.—Sec. Lt. Ronald Charles Wybrow Morgan, South Wales Borderers and R.F.C. (died on July 28th in hospital from wounds received the preceding day), was the only child of A. Herbert Morgan, of Westgate-on-Sea, and Mark Lane. Born in September, 1897, he was educated at Doon House, Westgate-on-Sea, and at Uppingham School. In July, 1915, he obtained his commission in the South Wales Borderers, was attached a year later to the Royal Flying Corps, and secured his pilot's certificate early in the present year. In April last he went out to France, and remained there until his death.

MORRISON.—Sec. Lt. Lindsay Morrison, R.F.C., who died on July 28th as the result of a flying accident in England, was the son of Mr. and Mrs. J. A. Morrison, Bairnsdale, Australia.

NORRIS.—Sec. Lt. Harold Aubrey Blurton Norris, R.F.C., whose death was announced last week, was 21 years of age. He joined the London Regt. on the outbreak of war, and went to France in February, 1915, being invalided home in the following July. He received his commission in July, 1916, gained his wings in December, and proceeded to France in May last.

O'BEIRNE.—Lt. Arthur James L. O'Beirne, Yeomanry, attached R.F.C. (died on July 27th of wounds received in action the same day) was the elder and only surviving son of Major O'Beirne, late Royal Warwickshire Regt., and of Mrs. O'Beirne, of Astrop Grange, near Banbury, and Oughera, County Longford. He was gazetted Second Lieutenant in the Yeomanry in July, 1915, and was afterwards attached to the R.F.C.

PROTHERO.—Capt. Phillip Bernard Prothero, Argyll and Sutherland Highlanders and R.F.C. (killed in action on July 26th), was second son of the late the Rev. Edward Douglas Prothero and of Mrs. Prothero. He was 23 years of age, and was Lieutenant in the Argyll and Sutherlands in May, 1916; in the following September he was given the rank of Captain whilst a Flight-Commander in the R.F.C.

RODOCANACHI.—Sec. Lt. Paul Rodocanachi, R.F.C. (killed in action on July 27th), was 19 years of age, and had a commission in February this year; he was gazetted Flying Officer in May.

ROSS AND MICHENCI.—Major Arthur Justin Ross, D.S.O., R.E., the Commander of an Air Station in the Eastern Counties, met his death on the night of August 2nd when piloting a biplane. He was accompanied by a pupil, Lt. Leo Michenci, Canadian Engineers, attached R.F.C., who was also killed. The machine appears to have got into a spinning nose-dive when about 300 ft. from the ground.

Arthur Justin Ross, D.S.O., R.E. and R.F.C., was the only surviving son of Mr. G. E. A. Ross, K.C., and of Mrs. Ross, of Warwick Road. He was born in July, 1881, and passed out of Woolwich into the Royal Engineers in May, 1900. He was promoted in May, 1903, and after being on half pay rejoined the Corps of Royal Engineers, and had his captaincy in 1910. In January, 1911, he was seconded for service with the Egyptian Army.

Major Ross, who had his majority in June, 1915, was appointed Flight Commander, R.F.C., in June of last year. His award of the Companionship of the Distinguished Service Order was in the Birthday Honours List of 1916, and he also held the Egyptian Honour of the Nile (4th class).

The father of Major Ross has been well known in real tennis at Prince's and Queen's for many years, and is Chairman of Queen's Club.

SCAIFE.—Lt. Thomas Earle Gordon Scaife, M.C., Dragoon Guards, attached R.F.C., who was reported missing while flying over the enemy lines on September 26th, 1916, is now officially presumed to have died on that date. Born at Leicester in 1892, he was the only son of Mr. T. E. Scaife, M.Inst.C.E., Cape Town, and Mrs. Scaife, Earles Dyke, Camps Bay, C.P. He received his education at the South African College School, Cape Town, and was farming in South Africa when the war broke out.

He was a trooper in the Mounted Rifles of the Union Defence Force, but having received a nomination he entered Sandhurst in May, 1915, and in September of the same year he was attached to the R.F.C. In December he went to the front and was continuously flying, with the exception of a few days' leave, until he met with his death.

On the day after he was missing his brigade commander wrote:—"Your boy had been covering himself with glory during the whole of the fighting. He was the best exponent in my brigade of some new and very important work, and the corps for whom he was observing were full of his praises."

In August, 1916, Mr. Scaife was awarded the Military Cross for skill when on contact patrol work during active operations. On one occasion, when flying at 1,000 ft., his petrol tanks were pierced by shell fire. He managed to stop the holes and enabled his pilot to bring the machine home. He had been several times mentioned in dispatches.

SMITH.—Capt. Geoffrey Cholerton Smith, M.C., A.S.C., attached R.F.C., who died of wounds on July 31st, was the younger son of Mr. and Mrs. Alfred Smith, of 11, Magdalen Road, Wandsworth Common. He was born in April, 1897, and was educated at Emmanuel School, Wandsworth Common, and Strand School, Brixton. He was a member of the school O.T.C., entered Sandhurst in April, 1915, and was gazetted to the Army Service Corps in August, 1915. He was sent to the front in September, 1915, was attached to a French mortar battery in June, 1916, and took part in the battle of the Somme. He was awarded the Military Cross for gallant conduct in an engagement. He was transferred to the R.F.C. last January, and took part in the Wytschaete and the present offensive.

TURNER.—Lt. W. G. D. Turner, R.F.C., whose death was announced last week, was educated at Heath Mount, Hampstead, St. Cuthbert's, Malvern Link, and at Malvern College, where he was a member of the college O.T.C. He went up to St. John's College, Oxford, in October, 1914, where he joined the University O.T.C., from which he obtained the next month a commission in the Middlesex Regt. After serving for about a year and a half he exchanged into the R.F.C., and gained his "wings" in July, 1916, being appointed an instructor on the day he became pilot. For many months he acted as an instructor with various squadrons, and last May he went abroad.

On May 24th he was returning from a reconnaissance over the enemy lines when he was attacked by hostile aircraft. He was then reported missing only, but is now reported killed. The C.O. of the squadron which he left when he went to the front writes:—"It was with the greatest sorrow that I heard of the death of your son. As you know, he was extraordinarily popular here, and I feel his loss very much, both as a personal friend and as an officer who had worked hard and well for this squadron. I wish that he were still here and going overseas with us, but one could not expect one of his temperament to wait so long; it was only natural of him to want to go. . . . I am more sorry than I can express." His Squadron Commander in France wrote:—"Your son had been with this squadron only a few days, but I had already come to look on him as one of my best officers, and I shall miss him very much, as will all my officers."

WALTER.—Capt. and Flt. Comdr. Stephen Reginald Parke Walter, the Queen's and R.F.C. (killed in action on August 1st), was only child of Stephen Walter, late Captain 3rd Dragoon Guards, and of Mrs. Walter, The Parsonage, East Farleigh, Kent. He was 20 years of age, and received his commission in the Queen's (Royal West Surrey Regt.) in December.

WEBB-SMITH.—Sec. Lt. Charles Webb-Smith, who died as the result of an accident while flying on July 28th, was the eldest son of Mr. and Mrs. A. L. Smith, of Tenbury, and the husband of Gwladys (née Hillsdon) Smith, of 12a, Latham Terrace, Bedford Park. He was 25 years of age.

D'ERF WHEELER.—Capt. Percival Francis Crommelin d'Erf Wheeler, Dorset Regt., attached R.F.C., whose death was announced last week, was born at Jerusalem in April 1894, and was educated at Clare House, Beckenham, and Trent College. In August, 1913, he was gazetted to a commission, and in September, 1914, he was sent to France in charge of a draft, and a month later was severely wounded at La Bassée. This incapacitated him for active service for the next 14 months, but for the last six months he was able to do duty with the regiment at home.

He was promoted Captain in February, 1915, being then not yet 21, and in December of the same year he took a draft to Mesopotamia, where he served for eight months, at the end of which illness compelled his removal to hospital at Bombay. When about to return to Mesopotamia he was recalled for training in the R.F.C., and he returned home last January. He had completed his course, and was on the point of receiving his wings when he met his death while flying at an aerodrome in England.

WILLIAMS.—Sec. Lt. Vaughan Floyer Williams, R.F.C., whose death was announced last week, was educated at St. Edmunds, Hindhead, and at Rugby (Mr. St. Hills), and joined the R.F.C. a few days after leaving school in July, 1916. He obtained his wings in the following October, and went to the front at the beginning of this year. He was home on leave in the latter part of March, and was killed the day after he rejoined his squadron.

ENGAGEMENT.

SKIDMORE-JONES—TOTTENHAM.—An engagement is announced between Clifford J. Skidmore-Jones (Corporal, R.F.C. Wireless), only son of Mr. and Mrs. Skidmore-Jones, Cromer House, Halesowen, and Muriel Tottenham, daughter of the late Rev. Mr. Tottenham, formerly rector of Thurning, Oundle, and of Mrs. Tennant-Austen of Glenfarne, Astwood Bank, Warwickshire, and Bournemouth.

* * *

The marriage arranged between Mr. Ralph Knott, R.F.C., and Miss Josephine Sullivan will not take place.

MARRIAGES.

BARRINGTON-BAKER—NEAL.—On July 30th, at St. Mary Abbott's, Kensington, Lt. Montagu Barrington-Baker, R.F.C., son of the late Rev. Charles Baker, was married to Dorothy Francis, youngest daughter of Mr. and Mrs. Neal, of Kensington, by the Rev. Herbert Allen, M.A.

FERGUSON—FERGUSON.—On August 2nd, at St. Peter's Church, Regent Square, Lt. Ronald Ferguson, R.F.C., youngest son of the late Capt. Hugh Ferguson and Mrs. Ferguson, New Brighton, was married to Dorothy, youngest daughter of the late Capt. H. S. Ferguson, Rosario, Argentine Republic, and Mrs. A. Ferguson, "Boxholme," Buxted, Sussex, by the Rev. C. W. Steffan.

HOLLAND—BREACH.—On July 28th, at the Parish Church, Steyning, Capt. Sydney Henry Holland, the Queen's R. W. S. Regt., attached R.F.C., son of Mr. and Mrs. Arthur Holland, Dunedin, Horsham, was married to Cicely, daughter of W. Powell Breach, J.P., Sussex, and Mrs. W. Powell Breach, Newham, Steyning, by the Rev. A. Congreve-Pridgeon, B.A., Vicar.

MILNE—HANMER.—The marriage of Capt. John Milne, M.C., R.F.C., elder son of Mr. and Mrs. Jack Milne, of The Brook House, Sutton Courtenay, Berks, to Joan, younger daughter of Mr. Thomas Hanmer, took place at Sutton Courtenay on July 24th, the Rev. E. B. Mackay officiating. The honeymoon was spent at the Norman Hall, Sutton Courtenay, kindly lent by Mr. and Mrs. Dudley Cory-Wright.

SEELY—NICHOLSON.—The marriage of Brigadier-General the Right Hon. J. E. B. Seely, C.B., D.S.O., M.P., of Brooke House, Isle of Wight, to the Hon. Mrs. George Nicholson, widow of Capt. George C. N. Nicholson, R.F.C., and youngest daughter of Viscount Elibank, took place on July 31st at St. Ethelburga, Bishopsgate, the Rev. Dr. Cobb officiating. The bride was given away by her father-in-law, Sir Charles Nicholson, Bart., M.P., and Major Sir Archibald Sinclair, Bart., 2nd Life Guards, acted as best man.

Sec. Lt. R. J. Grandin, A.S.C., attached R.F.C., has been missing since May 18th. Will those communicating with R.F.C. officers now prisoners in Germany, either in hospital or camp, kindly inquire as to the fate of the above?—Any information will be gratefully received by Mrs. R. J. Grandin, 58, Anson Road, N.

* * *

GEORGE RONALD ELLIS deceased.—Notice is hereby given that all Creditors and other persons having any claims against the estate of George Ronald Ellis of the Royal Flying Corps formerly of Easthorpe, Mirfield, in the County of York (who died at Penston, Pencaitland, East Lothian, on the 26th day of July, 1917), are hereby required to send in particulars of their claims to the undersigned on or before the 1st day of September next,

after which date the estate will be distributed having regard only to the claims of which the undersigned shall then have notice.

Dated the 4th day of August, 1917.

CHADWICK, SON AND NICHOLSON, Solicitors,
Dewsbury.

The special correspondent of the "Morning Post" writing from the British front of the offensive operations then in progress on the Ypres front on August 1st, says :—

The battle has been a signal triumph for the gunners as well as for the infantry, while the Flying Corps, prevented by the weather from playing their usual part, took part in the operations in a new guise, and as "cavalry of the air" many venturesome pilots distinguished themselves in the advance against the enemy. Flying extremely low, owing to the haze, they engaged machine-gun redoubts and posts single-handed, and several hostile strong points were silenced by their fire.

It was the first great battle of this war fought entirely without the assistance of aeroplane observation—the opposing armies were as blind as though aircraft had never been invented—and our machines did not turn in a single battery call. Nevertheless, they did great service as "flying cavalry." Some intrepid craft dropped so low that they nearly brushed the concrete forts with their wings, and they raked the trenches around them before the occupants could try to reply.

* * *

The special correspondent of the "Morning Post," writing from the British Front on August 2nd of the present offensive, says :—

The part played by "the Cavalry of the Air" in Tuesday's battle included some of the most remarkable exploits yet performed by the adventurous young gentlemen of the Flying Corps. Rain and low-lying clouds rendered them useless for scouting in their usual positions high above the advancing armies, so they fought the Germans in the mud instead of in the air.

Heedless of "Archies," machine-guns, revolvers, and wild barrages by rocket batteries, they sailed low over our mud-stained infantry, noted their position, and came back with their accurate sketch maps of ground which they had hastily pencilled in the cloud with blind shells cracking all around them. But most wonderful of all were the duels with motor-cars on the roads, German troops in column, aerodromes, and miscellaneous units discovered by these keen-eyed scouts in the Flemish fields and villages behind the enemy's battle-front.

It must be remembered that the weather was extremely bad, with cloud banks only five hundred to a thousand feet above the plain. Yet, despite conditions which could hardly have been worse, one formation alone flew for 396 hours on Tuesday, fired over 11,000 rounds of machine-gun ammunition, all at ground targets, crashing down six Hun aeroplanes, and setting alight one balloon.

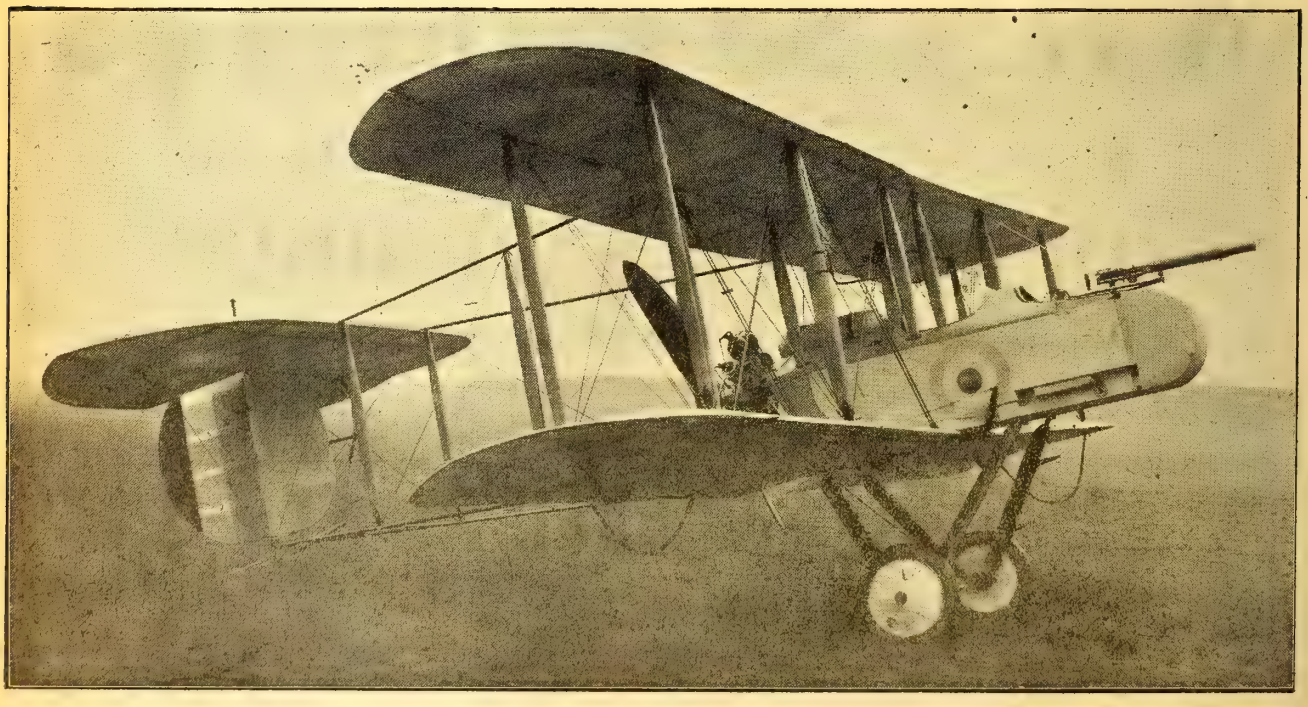
Here is the experience of one fighting pilot. He started at four o'clock in the morning, at the beginning of the battle, when the light was still bad, and flew over canals and roads in the invaded territory to a certain German aerodrome. One workman was walking across the ground, and he paid no attention to the sky, evidently confident that it was impossible for a hostile machine to attempt an attack. Lieutenant X. dropped a bomb neatly on one shed. Men appeared running in all directions. The machine sailed along one side of the aerodrome low enough for the pilot to fire his machine-gun into the open doors of the sheds as he passed, then swerving across to the other side he bombed a second shed. Hardly had the bomb exploded before the pilot was back again, bombing a third shed opposite. Lieutenant X. aimed a bomb at a fourth shed, but the release lever did not work, so he went up into the clouds and leisurely adjusted it, dropping a few moments later into clear air just above the aerodrome. His fourth bomb fell between a shed and a railway train, damaging both of them.

By this time the Germans had recovered sufficient presence of mind to bring a machine-gun into action, so the aeroplane flew angrily at the gun, firing in reply, and scattering the enemy crew in all directions.

Then Lt. X. sailed once more past the open sheds, firing into them until the ammunition in his gun was exhausted. Again he climbed into the friendly clouds just above, changed his drums, and slipped down with his machine-gun replenished, actually touching the ground between the sheds. He emptied the drum into the aerodrome at various angles—not a soul was to be seen—and apparently this satisfied him. He flew away. A little distance down the road he came upon two German officers indulging in a morning ride. He dived at them and fired, and their horses bolted.

Then he sighted a column of about 200 infantrymen marching along the muddy road. He flew just above their heads, and his machine-gun chased them into the fields and hedges. Again he changed his drums in the clouds. When he came back for a third bout in the open country, two enemy machines, which were apparently seeking him at the frenzied request of the harassed aerodrome, drove at him, but he sent one crashing down and the other thought better of it and went away. As he circled back he saw German soldiers collecting around the wrecked machine in a field, so he fired into them. A number ran away, others lay down, and he undoubtedly killed some of them. This appears to have exhausted Lt. X's. ammunition, and he came home.

Even more remarkable was the morning flight, in the first hour of the battle, of an eighteen-year-old aviator, who was allowed out alone for the first time. He started with another machine, but soon lost sight of it in the clouds and was entirely left to his own resources. The first target that caught his eye behind the German lines was an open motor-car containing three officers. He dived down and fired into it. The car swerved drunkenly into the side of the road, nearly overturning, and when the boy saw



THE VICKERS "GUN-'BUS."—The first successful aeroplane designed specifically for fighting. During 1915 and 1916 these machines, with 100-h.p. Monosoupape Gnôme engines, did excellent work in France, and continued to do so long after they should have been considered out of date by any thoroughly organised supply department.

this he circled back, swooped down, and recommenced firing. An officer in the back seat pulled a revolver out of his holster and returned the fire.

Here was a real duel. Our young knight of the air shut off his machine-gun and responded with his own automatic pistol—generously determining to meet his adversary with his own weapons. He was only twenty feet behind the car when it drew up suddenly in front of a cottage, and he saw the occupants of the car carrying one of their number, dead or badly wounded, into the house. He wheeled and fired repeatedly into the roof of the cottage with his machine-gun. Then he returned and fired a Véry light into the motor-car, hoping to set it on fire.

Another aviator, who went out in the dawn to bait German aerodromes, found a camp of tents around a cottage, where men were washing in the open, and sent them panic-stricken to every point of the compass. Still another, who dropped at an aerodrome, saw mechanics working inside a shed, and poured a stream of bullets through the open doors.

* * *

On August Holiday Monday at Aldershot, the administrative wing of the Royal Flying Corps held a successful meeting. Among the winners were: 100 yards, Air Mechanic Copp; half-mile, Air Mechanic Chapman; quarter-mile, Sergeant Bennett; long jump, Cadet Portman; high jump, Cadet Phelps; mile, Air Mech. Smith; 220 yards, Chief Mechanic Perry; 660 yards, Air Mechanic Chapman.

FRANCE.

Official Communiqués.

August 1st.—Captain Guynemer has won his 50th victory.

August 2nd.—Between July 21st and 31st, 20 enemy aeroplanes and two kite balloons were brought down. During this same period 21 aeroplanes were hit and fell in their own lines.

Lt. Marcel Hugues has brought down 5 German machines.

During the above-mentioned period a dozen of our squadrons made numerous raids and bombarded, among other places, the railway stations of Roulers, Metz, Thionville, Montmédy, and Bétheniville, the Hagondange Works, the cantonments and bivouacs in the Forest of Houthulst and Spincourt, and in the Valley of the Suippe, and munition dumps in the Laon district. About 40 tons of bombs were dropped in these raids, which caused much damage.

Army of the Orient.—Bombardments of enemy installations have been carried out by British aviators in the Ghevgeli and Demirhissar zones and by French aviators to the north of Monastir and to the north of Koritza (in Albania).

August 3rd.—Army of the Orient.—Allied aviators bombarded the enemy camps in the region of Demirhissar and that of Lake Malik (south of Lake Ochrida).

* * *

The French Ministry of War announced on August 1st that Capt. Guynemer has won his 50th air victory.

As the successes of French aviators are most scrupulously investigated before they are credited to them, it may be taken that the official announcement means that Capt. Guynemer has destroyed 50 German aeroplanes. It does not at all follow that this is the total number of enemy machines that he has driven down. Guynemer's wonderful record is the work of about two years. As a Sergeant-Aviateur he had brought down his fifth machine at the beginning of February in last year, and, in the interval, he has accounted for 45 other enemy aviators, and been promoted progressively to the rank of Captain. He heads the list of victorious French aviators, and has been decorated with the Legion of Honour, the Medaille Militaire, and the Russian Cross of St. George. He has also achieved the distinction of bringing down four of his enemies in one day.

* * *

It is reported that a German aviator dropped bombs on the German prisoners' camp at Amiens on July 30th.

GERMANY.

Official Communiqués.

August 1st.—Front of Crown Prince Rupprecht.—The brilliant bravery and dash of our infantry and pioneers, the heroic endurance, and the excellent effect of the artillery, machine-guns, and mine-throwers, the intrepidity of our aviators, and the most faithful fulfilment of duty on the part of scouts and other auxiliary arms, and especially the purposeful, quiet leadership, offered certain guarantees for the termination of the battle day in our favour.

August 6th.—In an aerial fight, Lt. Gontermann shot down his 25th opponent.

* * *

A message from Amsterdam, dated August 5th, states that, commenting on the recent speeches of Mr. Lloyd George and Sir Edward Carson, Count Reventlow says in the "Deutsche Tageszeitung": "Our best answer to each of these insolent speeches would be sprinkling London with bombs every time they are delivered."

RUSSIA.

Official Communiqués.

August 2nd.—On July 31st a number of enemy machines appeared seven times at various points along the coast and the islands of the Gulf of Riga. At Mentoi and Arensburg they dropped 20 bombs without results. The enemy machines flew as far as Kujvast (near the mainland), where they were met by artillery fire.

An enemy Zeppelin flew over Tserel (southern extremity of Oesel Island, north of the Gulf of Riga).

A squadron of our aeroplanes, consisting of 24 machines under the command of Lieutenant-Colonel Konovaloff, made a flight over St. Voigiany (on the Lida-Molodetchno railway); over 60 bombs were dropped.

Enemy aviators dropped bombs on the village of Mikh Nev (to the south-east of Smorgon) and on Sinaev.

August 3rd.—Aviation.—In the region of Khotin our aviator, Sec. Capt. of Cavalry Kozakoff, brought down his 15th enemy aeroplane, the Austrian occupants of which were taken prisoners.

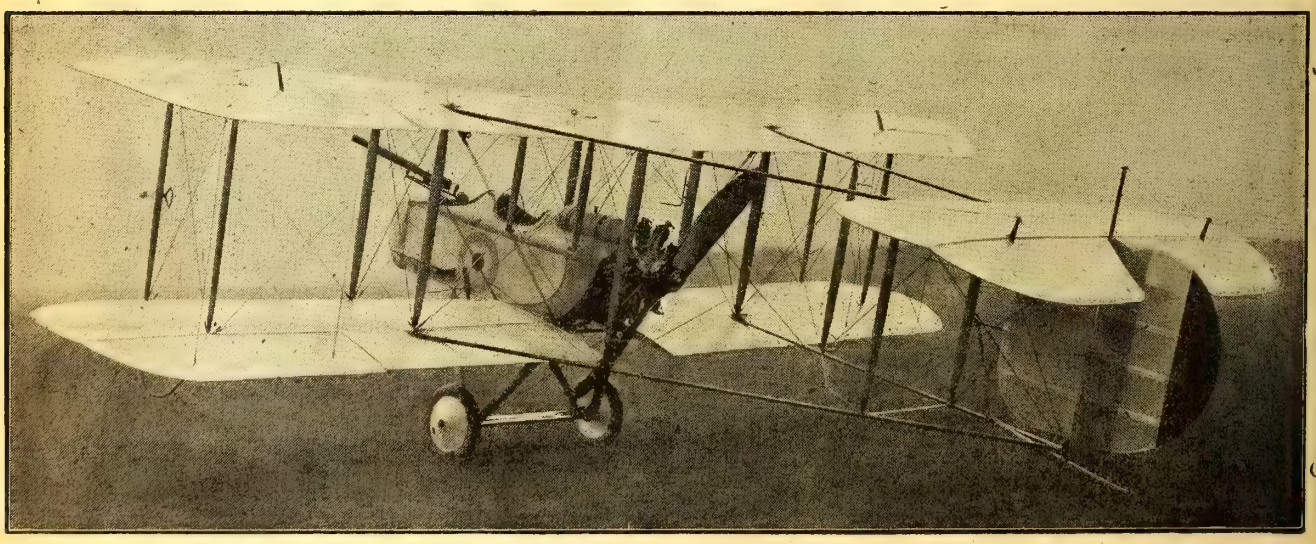
August 6th.—Aviation.—On the night of August 5th our aeroplanes made a flight over the railway station of Baranowitschi, and dropped a number of bombs. Direct hits on the station were observed.

ITALY.

Official Communiqués.

July 31st.—This morning an enemy machine was brought down in flames near Podgora (on the right bank of the Isonzo, opposite Gorizia).

August 3rd.—Above Tolmino one of our aviators brought down one enemy machine in flames and obliged another to land in its own lines, where it was afterwards destroyed by our artillery. Last night our large flights effectively bombed the arsenal and



Back View of the Vickers "Gun-'Bus," with 100-h.p. Monosoupape Gnôme engine. The most successful two-seater "pusher" machine of the 1915-16 period of the war.

military works of Pola, all returning safely to their bases. Enemy machines carried out a bombing raid on some inhabited localities on the Lower Isonzo, causing a few casualties and doing slight damage.

August 4th.—During the air fights of the 2nd inst. a third enemy machine was brought down besides the two already reported.

Last night our flights renewed the bombardment of the arsenal and military works of Pola, causing great destruction and big fires, which they were able to observe before returning safely to their bases.

August 5th.—During the night of the 4th enemy aircraft carried out bombing raids on various inhabited centres on the plain between the Isonzo and the Tagliamento, but there were no casualties, and only slight damage was done. An enemy seaplane was brought down by our anti-aircraft guns and fell in the River Po, near Ponte Lagoscuro, the aviators being made prisoners.

* * *

The following account is taken from the dispatch issued by the Italian General Staff at General Headquarters of the aerial operations on the Italian fronts from March to June, 1917 :—

During this period of the offensive the Italian aviators took a conspicuous part in brilliant air fighting, in patient and continuous reconnoitring flights, and in successful bombing raids.

Thirty-five Austrian machines were brought down in air fights or by anti-aircraft guns.

Large quantities of explosives were several times dropped on the Austrian railway lines and on their points of assemblage at Volcia Draga, Rifemberga, Opcina, S. Daniele (Branizza), S. Lucia (Tolmino), in the Adige and Brenta valleys, and on the Asiago plateau.

The Vipacco valley, where Austrian troops and hutments were massed, and where there was intense convoy and artillery traffic, was bombed day and night by airships and aeroplanes with successful results.

Veritable air battles took place on May 23rd over the Austrian lines at Medeazza and Flondar, and on June 19th during the fighting in the Mt. Ortigara area. During these battles reconnoitring aeroplanes preceded in the vanguard to discover the enemy guns, the big battle-planes followed closely, dropping immense quantities of explosives on the enemy's trenches, and even flying low enough to attack with their machine-guns, while chasing 'planes effectively carried out their work of protection by engaging the numerous enemy machines who attempted to repulse them.

The Italian Army has thus victoriously entered on its third year of war, proving by its great increase in material and continued progress in organisation that it is ably seconded by an incessant display of physical and moral energy on the part of the entire nation in arms, which, conscious of the value of the work done and of its own strength, has perfect faith in the final victory.

HOLLAND.

The "Telegraaf" (Amsterdam, August 5th), learns from Nes, Ameland, that a German aeroplane has landed there owing to engine trouble. The two occupants have been interned and the aeroplane, numbered 931, has been taken to Nes village.

A German seaplane came down at 6 a.m. on August 6th near Cocksdorp, on the Island of Texel, after it had been fired at by Dutch soldiers. The seaplane, No. 1,101, was a large biplane, built at Friedrichshafen in April. It came from the North Sea and was short of petrol. The aviators have been interned.

U.S.A.

Charles Fleischmann, son of Mr. Julius Fleischmann, the multi-millionaire yeast manufacturer, and his companion, Harry Witts, were drowned on August 3rd while flying a seaplane at Great South Bay (between Fire Island Beach and Long Island). Something went wrong with the engine, and the machine dived from 600 ft. into about 6 ft. of water, the aviators' bodies being driven right down into the mud and completely buried. It is presumed that something went wrong with the controls of the machine.

THE AERONAUTICAL SOCIETY.

New Members.—The following have been elected members of the Society in the various grades :—

Associate Fellows.—William Herbert Hatfield, D.Sc. ; Edgar Alfred Allcutt, A.M.I.C.E., M.Sc., A.M.I.M.E. ; Samuel Turner ; Ivan Owen Williams, B.Sc., A.M.I.C.E. ; Henry Edgar Broadsmith.

Members.—Frank Bernard Harford, Capt., R.F.C. ; Albert Edward Banett ; Carleton George Chapman, Capt., Aviation Service, U.S.A. Army.

Associate Members.—William R. Catesby ; William Stevenson Storie ; Arthur W. Cutbill ; C. H. Wallis.

Student Members.—Charles Watson Hall ; Laurence Dove ; Edwin H. Moyes ; George Isaac Price.

THE N.P.L. AGAIN.

The following letter has been received :—

Sir,—In their report for 1912—13, page 77, the "powers that be" at the National Physical Laboratory have applied the term "Phillips Entry" to the underside of an aerofoil. This is not only incorrect, but very unfair. The term should, of course, be applied to the forward upper portion as set forth in my 1884 patent. It is a curious fact that in spite of great expenditure in time and money nobody has yet succeeded in "getting round" the subject-matter of my patent of 1884.

(Signed) Horatio Phillips.

West Barnham, Sussex.
4/8/17.

[Mr. Horatio Phillips was the originator of the "Phillips Entry," which is the shape of leading edge very generally used on the most efficient aeroplanes. His complaint brings to notice another example of the careless or unfair way in which the N.P.L. goes about the work for which its officials are so highly paid by an innocent nation.—Ed.]

THE HOME SECRETARY AMONG MUNITION WORKERS.

Sir George Cave, the Home Secretary, and Sir Worthington Evans, Secretary to the Ministry of Munitions, visited the works of Messrs. Gordon Watney and Co., Ltd., on August 2nd.

The visitors were impressed by the splendid results achieved during the past couple of years, especially since the erection of the additional huge workshops, and they could not fail to appreciate the enthusiasm and assiduity of the workers. Throughout their inspection Sir George Cave and Sir L. Worthington-Evans were accompanied by the Hon. R. C. Butler (Chairman of the

A Batch of S.I.A. Biplanes. A high-powered Italian version of the Maurice Farman.

Directors of Messrs. Gordon Watney and Co., Ltd.), Major Gordon Watney (Managing Director), Messrs. J. Costigan (General Manager), Cyril Chamberlaine (Assistant General Manager), Dews (Chief Engineer), and H. M. Zillwood (Works Manager).

Passing through the drawing and general offices, the visitors next visited No. 1 machine shop. Here, dealing with the lighter work, women predominate in numbers. Sir George stopped some time to inspect the work on aeroplane engine cylinders, and was much interested in the automatic and milling sections. Passing into No. 2 machine shop, he found a big range of Herbert automatics doing good work in the heavy lathe section. Here, again, women labour was well represented, although the percentage is not so high as in the former shop.

In the tool shop the visitors were shown how the gauges, jigs, and special tools required are produced. No. 3 shop is a heavy section, consisting principally of boring machines, centre lathes, radial drills, and the grinding section. The Home Secretary stopped some time to inspect Clerget crank cases in various stages of manufacture.

The fitting shops were the next call, the visitors being welcomed with the engineer's greeting—the banging of tools on metal.

Evidence of the diversity of the firm's work was shown when the testing stands were visited by the fact that in the stands were a 140-h.p. R.A.F., a 120-h.p. Beardmore, a 130-h.p. Clerget, and two 80-h.p. Gnomes, all being finally and thoroughly tested prior to leaving the factory.

Subsequently, the visitors were much interested in the heat-treatment shop. The brief visit must have convinced the officials that Messrs. Gordon Watney and Co., Ltd., turn out aeroplane engines, right from the bar material to the finished article, and that experts are in charge of every department.

Towards the conclusion of the inspection, the employees, to the number of about 700, assembled in one of the Beardmore sheds for a few brief addresses.

Major Gordon Watney, in a short speech, remarked that Sir George Cave and Sir L. Worthington-Evans were two gentlemen whose whole lives had been devoted to the service of their country. He (the speaker) was anxious that it should be thoroughly demonstrated to Sir George Cave that many of the remarks made in the daily papers did not appeal to the employees of that factory; he was referring to the unrest amongst the engineers. He thought they would agree with him when he said that as between himself and those present there was nothing except the friendliest possible relations, and it was their intention to give the maximum amount that they could possibly give to His Majesty's Government.

Sir George Cave, who was enthusiastically received, said he did not like to make speeches, nor did he suppose they wanted to listen. He had come down with Sir L. Worthington-Evans to see something of the work of a great factory like that. There was no work in the country which could interest them more than such work. They talked, and they talked rightly, of the splendid work their men were doing at the Front both on land and in the air. (Hear, hear.) They were all thinking that day of the great battle which was going on in France and in Flanders—good luck to our soldiers over there. (Hear, hear.) As they knew, unless those men and women and girls, and hundreds and thousands like them, were doing their work at home, they could not hope to win the great victory which they were going to win in France.

Without the support of the men and women in munition works those splendid fellows abroad could not fight their enemies. They had got some grousers in the House of Commons. (Laughter.) He did not find any grousers here. They had got pacifists, too, though he did not find any of them here. They must defend their country and they must fight through this war, cost them what it might.

No trouble justified the cessation or suspension of work of this kind in this country. If there be trouble or if there were grievances, let them hear what they were and they would be met, and for heaven's sake let no man take the grave responsibility of stopping that work, which was essential to the success of our men at the Front, for a week or for a minute! He congratulated the management and themselves on the work which his friend and he had seen that day, and he hoped and knew they would go on with that work till the victory for their country was won. (Loud cheers.)

Sir L. Worthington-Evans congratulated the management and the workers of that factory heartily on the magnificent results of their combined efforts. He congratulated the skilled men, who had been educated to the work, and the "dilutees" upon the quickness with which they had picked the work up, which was not their work before the war, and which was work of the highest skill. He congratulated that happy diluted family from the bottom of his heart. (Loud cheers.) Three cheers were then given for the King, Sir George Cave, Sir L. Worthington-Evans and Major Watney.

THE LABOUR QUESTION AND AEROPLANE OUTPUT.

A correspondent writes to the editor of this paper:—

Sir,—Having read your article under the heading of "Aeroplane Supplies" in the "Observer" of Sunday, July 29th, I am presuming to write to you to express my appreciation of such an able, absolutely truthful, and, to my mind, plucky expression of opinion.

For some years previous to the war, and for some little time after, I was manager for a firm of building contractors and joinery manufacturers, a business which had to be closed down owing to the conditions prevailing. I have since been working as an operative woodworker in aircraft construction, and that is the reason I so appreciate your article.

Waste of Labour.

The wastage of labour that I have experienced is appalling; it is, in fact, wantonly wicked. On every hand one hears the same cry from a large majority of the workmen—"don't do too much"—and so far at no time I know of has any effort been made by the management to get anything like a fair and proper day's work done by an operative.

How these firms are paid I do not know, but this I do know, that neither of the firms I was with could have carried on a month under proper and fair competitive prices. For weeks I and hundreds of others booked 90 hours per week. In actual time made this means working (or going to work) four days at 12 hours, one day at 11, one day at 9, and one at 8 hours, 76 hours actual time, the balance being the extra allowance for overtime. Many has been the week that not 10s. worth of work has been done by any one of us, and we received close on £5.

Waste of Time.

My first experience was on a machine engined with a 80-h.p. Gnome, giving 73-83 m.p.h., fitted with machine-gun and bomb-dropping gear. The machines were elaborately finished, emblazoned with the coat-of-arms of the city in which they were made. What each one cost I do not know, but were they worth 2d. each? And to the brave fellows who had to fly them, I contend, they were a danger. I expressed this opinion there, and was taken off them. I do not know that my expression had anything to do with this—in all probability not.

There were a number of seaplanes in for overhauling and repair—eight, I think. I and seven others were put to work on one of them, and for 16 weeks we fiddled about this machine, and in addition there were three or four fitters, several girls, two trimmers and two painters, all of whom put in about the same time. When we had finished with it, and had wasted another two days while it was tested, the planes were removed and it was trundled to a railway station, taking another day, and as it was late when we came away from the goods yard we were booked 15¾ hours for that day, 15 of us, I believe. Then four men were sent to Dover, I believe, to re-assemble it, taking another week to ten days.

That machine was out of action for six months all told, and I fully and honestly believe that all that was really necessary was for the fabric's removal, a repair to the fuselage owing to a previously made bad joint, the planes tuning up, the engine and controls overhauled, and bomb-dropping gear fixed, at an outside cost of £200, and she ought not to have been out of action for more than a month.

Waste of Material.

I asked for my discharge and left this firm, starting for another one in the same city, only to find pretty much the same conditions prevailing. A little improvement, perhaps, in the management, and they certainly were turning out a machine that was speedy and serviceable, with not so much attention paid to spit and polish, so dear to the heart of the A.I.D. But this firm under good management could increase their output very materially without employing a bigger staff; in fact, I believe, double it.

I believe the cause of a lot of the labour unrest in aircraft factories is owing to the fact that men have too much time to brood over their grievances and to chatter to one another about them. I have had quite a lot to do with management of workmen, and I fully believe in paying them well, and the pay at present applying in this industry is not quite what it ought to be for the skilled and industrious workman.

Further, I feel certain that the hours worked, such as I have indicated, are not conducive to quick and economical production.

Your suggestions are, I think, excellent, and I sincerely hope will receive the consideration they deserve. It is more than likely I have bored you with a good deal of what I have written, and my only reason for writing you at all is that you are the only writer of all whom I have read who has hit the nail in the right place. I should like to say all I have written of has happened during this year, and the machine I first refer to is still being made.

THE CURTISS CORRUPTION CHARGE.

At Bow Street Police Court on August 3rd William Augustus Casson and Wing Comdr. John Cyril Porte, R.N.A.S., were charged before Sir John Dickinson with un'awfully conspiring together and with Lyman J. Seeley to contravene and set at naught the provisions of the Prevention of Corruption Act, 1906, in respect of large sums of money received by Porte, as agent of the Crown, in respect of contracts made between the Lords Commissioners of the Admiralty and the Curtiss Aeroplane Company, of New York.

The Attorney-General (Sir Frederick Smith), Sir Archibald Bodkin, and Mr. Roome represented the Director of Public Prosecutions; Sir George Lewis appeared for Comdr. Porte, and Mr. W. J. Synnott for Mr. Casson.

In his opening statement the Attorney-General said the Act under which the proceedings were taken was obviously directed against secret gifts by which a principal was practically made to pay a commission to his own agent. The matters involved in this case were discovered in the course of an inquiry made by direction of the First Lord of the Admiralty and presided over by Mr. Butcher, K.C., relating to transactions between the Admiralty and the Curtiss Aeroplane Company.

Sir F. E. Smith related how in 1914 Comdr. Porte went to America in connection with a scheme for flying in a seaplane across the Atlantic. The defendant Casson was also interested in that scheme, and was an old and intimate acquaintance of Comdr. Porte. The machine that was to fly across the Atlantic was one of two boats constructed by the Curtiss Company in July 1914, but the outbreak of war in the following month put an end to the project. Lyman J. Seeley (whose name was mentioned in the charge) was an American citizen who in 1914 was appointed publicity manager of the Curtiss Company in England, with a salary of £200 a year and 1 per cent. on all sales effected by him. There seemed to have been a verbal arrangement between Comdr. Porte and Seeley by which Comdr. Porte was to receive 20 or 25 per cent. of the selling price of all flying machines for which he obtained the order.

[This was before the war when Comdr. Porte was on the retired list, and had been engaged in the Aircraft Industry for some years.—Ed.]

When the outbreak of war put an end to the project of flying across the Atlantic, Comdr. Porte returned from America to England, and it was then proposed that the Curtiss Company's twin flying boats should be brought over here and offered to the Admiralty. From that point the case to be presented against the defendants depended very materially on the evidence given at Mr. Butcher's inquiry to which Sir F. E. Smith had already referred.

Comdr. Porte, after the outbreak of war, received a commission from the Admiralty in the R.N.A.S., and he was also commissioned to get an estimate from the Curtiss Company not only for the twin seaplanes or boats, but also for other machines. The result was that the seaplanes were bought by the Admiralty and delivered in October. All this time Mr. Casson and Comdr. Porte were in close association, and Comdr. Porte informed Mr. Casson of the 25 per cent. arrangement between himself and the Curtiss Company.

Mr. Casson knew of the favourable opinion the Admiralty had formed of the Curtiss machines, but he was also alive to the difficulties which might arise under the first section of the Prevention of Corruption Act. An arrangement was therefore made that Comdr. Porte should ostensibly give up all his business connection and transfer to Mr. Casson all his interests in the Curtiss productions under his agreement with Seeley on condition that Mr. Casson should discharge all duties in connection with that matter, and proceed when necessary to America at his own expense.

The object of this arrangement obviously was that if ever any question was raised it could be made to appear that Comdr. Porte had not benefited during the war from any transactions with the Curtiss Company, and then, after the war, Mr. Casson could, if he felt inclined to do so, deal fairly with Comdr. Porte. Such was the arrangement in writing, but the real arrangement between these men was a verbal one. It was to the effect that Mr. Casson should be put forward as the person dealing with the Curtiss Company; that Comdr. Porte's name should be kept out of it, and that all the profits—20 or 25 per cent.—should be nominally received by Mr. Casson, but should be afterwards divided in the proportion of three-fourths to Comdr. Porte and one-fourth to Mr. Casson.

Sir F. E. Smith went on to state that, needless to say, nothing in regard to that secret arrangement was disclosed to the Admiralty. A number of orders were subsequently given by the latter to the Curtiss Company through Comdr. Porte. At some time during the execution of these orders Seeley arrived in London and had interviews with Mr. Casson, with whom he made further arrangements about dividing commissions—that is, between Seeley as agent for the Curtiss Company and Mr. Casson as agent for Comdr. Porte, or as intermediary between the Curtiss Company and the Admiralty.

The ultimate arrangement was that Mr. Casson was to receive 15 per cent. on all the Company's Admiralty orders, but was to divide this 15 per cent. with Seeley, who would also get his direct commission of 1 per cent. from the Curtiss Company. This arrangement having been made, Comdr. Porte introduced Seeley to the Admiralty as the representative of the Curtiss Company, and large orders for aeroplanes, seaplanes, etc., were sent through him. The arrangement between Mr. Casson and Comdr. Porte was that of the 15 per cent. the former received from the company 7½ per cent. should be returned to Seeley, and that of the other moiety three-fourths should go to Comdr. Porte and one-fourth to Mr. Casson.

So large was the business done between the Admiralty and the Curtiss Company that in 1916 the orders placed with the latter reached eleven million dollars, of which five million dollars' worth had been delivered and six million dollars' worth paid for. Under the agreement already described, the remittances to Seeley by way of commission seemed to have totalled some £64,000, and of three-fourths of that sum Mr. Casson appeared to have regarded himself as the holder in trust for Comdr. Porte, on whose behalf he had meanwhile made certain payments and some investments, whilst he had retained about one-fourth, or £16,000 odd, for his (Casson's) own benefit.

Sir F. E. Smith argued that for that he had done nothing beyond acting as recipient of money which he had not earned, and as to Comdr. Porte, there could be no doubt that he knew all about the commissions which were being paid on the goods supplied by the Curtiss Company. Whether the prices paid by the Admiralty were reasonable or not had no relevance to this matter of corrupt commissions. It was not contended that Comdr. Porte was not a skilled aeronaut and seaplane expert, nor that he possessed valuable knowledge which at the outset of the war he had placed at the disposal of the Government. There could be no doubt that these persons knew that the Admiralty were paying enormous sums of money, some of which went to Mr. Casson for doing nothing. Mr. Casson was on the point of going to France when he was arrested, but it was not suggested that he was absconding. He had in his possession a letter from Comdr. Porte in which the latter suggested that things were going to move.

The case was adjourned until Friday next, and Comdr. Porte was allowed out on his own recognisances in £2,000. Mr. Casson was admitted to the same bail as before.

During Sir F. E. Smith's indictment, Comdr. Porte was seized with a fit of coughing, caused by the lung trouble through which he was invalided out of the Navy in 1911. This brought on hæmorrhage of the lung and he collapsed in Court. It will be remembered by those who have served with Comdr. Porte that he has suffered from tuberculosis for some years, and took to flying largely in the hopes of improving his health.

AVIATION IN JAPAN.

"L'Aérophile" for July 1st-15th contains some interesting notes about aviation in Japan, extracts from which are reproduced hereafter.

The part played by Japan in the development of aeronautics has been small, but private and public enterprise has achieved something. The visit of the American pilots, Art Smith and Charles Niles, did a great deal to stir up interest.

There have been differences of opinion in Europe and America as to the relative merits of airships and aeroplanes. So in Japan. The first Japanese aeronaut preferred the "lighter than air machine," and the balloon, "Yamada," played a great part in the Russo-Japanese war. Yamada, who died about two years ago, and who had studied much, was at the time of his death experimenting with various kinds of silk and other material with which envelopes are usually constructed. He remained until the end a fervent supporter of the airship.

The world, meanwhile, has decided in favour of "heavier than air," and Japan has wisely followed its lead.

The country has much for which to hope from the National Aviation Society, which was founded in 1914, and has since been very active. Other associations have been founded for the encouragement of particular activities.

The National Society has grown largely, and now possesses many thousands of members who believe firmly in aviation, and that Japan should take part in its development.

On several occasions the Society has announced the existence of three prizes from 20,000 to 50,000 yen for the best Japanese motor, as encouragement to the indigenous engineers. The results of these offers have not yet been made public. A large number of plans have been sent in, but apparently none have materialised. There is, however, no doubt that the Japanese are paying great attention to aeronautical motors, and are convinced

that their country should not rest content to copy, and that the active brains of the Eastern World should solve the great problem of the air.

Meanwhile, a machine built by Dr. Kishi, fitted with a motor also built by him, has done extremely well. It recently flew over Tokio, and it is said that numerous examples are to be built for the Army.

Encouragement is not lacking in other directions in Japan. The Imperial Aero Club recently received 10,000 yen from Mr. Soga Osaka to construct an aeroplane for looping the loop. This machine, whose construction is nearly complete, is equipped with a 90-h.p. motor, and will be flown by Mr. Osaka, son of the late Minister of Justice, who is learning to fly in Japan, and who will teach himself to loop.

Military aviation is developing. The grand military manœuvres have taken place at Kynshu in the presence of the Mikado. Several new methods were introduced on that occasion. In previous manœuvres only seven or eight machines figured in the operations. Last time 17 machines took part. The offensive and defensive armies had eight machines each, and the investigations of the officer pilots assisted the success of the two armies. The machines were used for night operations, and illuminating bombs were employed for watching the movements of the opposing troops.

A military review at Fukuoka succeeded the manœuvres. The 16 aeroplanes which took part flew overhead in battle formation at intervals of 300 metres.

Four Japanese (military) aeroplanes flew recently from Tokorozawa to Fukuoka, about 420 miles, without landing.

At the present time there is only one aviation station at Tokorozawa, but credits have been requested for the establishment of a station at Kagamiliara Jifu. It is believed that the whole aviation service will be reorganised very shortly.

OPPORTUNITIES IN CHINA.

A regular reader of The Aeroplane in China writes :—

On the subject of aviation in general in China, I regret to have to say that up to the present very few have taken an active interest in this science. Very few people could tell you the difference between a biplane, monoplane, and triplane, and I could almost say that the number who could correctly name a dozen differents parts of an aeroplane could be counted on one's fingers.

Folk in China have nevertheless had one or two opportunities of seeing actual flying. As far back as 1913 Shanghai was visited by an aviator, who, unfortunately, came to an untimely end on the Shanghai racecourse during a meeting there. Although I was not out here at the time, I can well remember reading about this, and since I have been out here I have endeavoured to obtain details of the catastrophe, but, as indicated in my previous remark on the ignorance of the people on the question of aviation out here, the details are somewhat confusing. Some say the machine was a monoplane of the Blériot type, others a biplane of the Farman type. From the various accounts that I have heard I have come to the conclusion that the cause of the fatal accident was that the aviator was trying to do things with a machine that although as good a one as was then made, was absolutely a death-trap when asked to perform feats that our present-day pilots would think twice about doing. However, this is old history now, and I will come to more modern events.

Miss Katherine Stinson, a Canadian aviatrix, has recently been touring this country with two biplanes of American design, and has met with quite a fair amount of success. Her exhibition included looping the loop, volplanés with engine stopped to within a few feet of the ground and then switching the engine on again and rising over the heads of the assembled crowd, etc. This latter performance I consider was an extremely dangerous exhibition, both from the spectators' point of view as well as from the pilot's, and one that should have been discouraged.

In Shanghai Miss Stinson unfortunately had bad luck with her engines, Gnômes, and was unable to fly on the advertised dates, but she showed her ability to fly about a week later when things had been put right.

The Chinese are a peculiar people, and I would advise anyone who may contemplate giving exhibitions in this country in the future to see that everything is in order before they advertise themselves, for inability to fulfil one's contract when Chinese have paid to see something might lead to ugly demonstrations. This latter piece of advice might well have been given to Miss Stinson, as it was only through the good offices of some of the police authorities and foreigners that her machines did not get badly damaged.

At Pekin Miss Stinson met with great success, and was the recipient of several tokens of appreciation from the powers that be in that place. At Hankow Miss Stinson's contemplated exhibition was knocked on the head by a misunderstanding of her manager, a gentleman who evidently thought that as Pekin had shown so much enthusiasm he would only have to say "I want this place for the exhibition," and no one would say him nay, but he found otherwise.

The only suitable ground was the Chinese racecourse, and on arrival in Hankow Miss Stinson's manager advertised that an exhibition would be given on that ground. Unfortunately the Chinese Race Club Committee thought otherwise and politely informed him that as they had made arrangements to have their course and approaches put in order at the time when Miss Stinson required it, they were very sorry, but they could not let the exhibition take place. The exhibition had therefore to be given up, much to the regret of a large number of would-be spectators.

The moral of this incident is, Don't think that you have only to tell Chinese that you want something and it is yours. The Chinese have a thing that they call 'loss of face,' and if they think that there is any chance of losing face they will do their best to do away with the chance. Approach a Chinaman through the proper channels, and there is very little that one cannot do; approach him through the wrong channels, and there is very little one can do.

From Hankow Miss Stinson went to Nanking, where successful flights were made. This is our most modern example of the science of aviation that we have had in this country.

At Pekin I believe the military authorities do attempt to run an aviation school, but with what success I am afraid I can't tell you. I don't believe any aeroplanes, apart from Miss Stinson's, have been imported into this country for a long time past, so if they are running this school at Pekin it must be with very antiquated machines.

In my opinion there is a great field for an enterprising firm of aeroplane makers in this country, and I feel convinced that should any British firm take the opportunity of being the first firm to manufacture aeroplanes and to establish a school they would find it a very paying proposition. I sincerely hope that you will be able to interest some good firm to take a trip, at all events, out to this country to see for themselves the possibilities. If a British firm does not do so, it is a ten to one chance that an American firm will, and after they have fully established themselves some one in the old country will wake up and find that what might have been a good market has been lost to them through lack of enterprise.

LANDSHIP versus AIRCRAFT.

Mr. Philip Gibbs, of the "Express," writing of the tanks in Flanders, says :—

One fight did take place with a tank, and it is surely the most fantastic duel that has ever happened in war. It was queer enough, as I described a day or two ago, when one of our aviators flew over a motor car and engaged in a revolver duel with a German officer, but even that strange picture is less weird than when a German aeroplane flew low over a tank, and tried to put out its eyes by bursts of machine-gun bullets. Imagine the scene—that muddy monster crawling through the slime, with sharp stabs of fire coming from its flanks, and above an engine with wings swooping round and about it like an angry albatross, and spattering its armour with bullets. It was an unequal fight, for the tank just ignored that waspish machine-gun fire, and went on its way with only a scratch or two.

[This deserves to go on record as the first example of a fight between aircraft and land-ships. Reference to The Aeroplane of a year or so ago will disclose a statement that war in the future will consist largely in fleet actions between forces of land-ships, with aerial scouts. So far the land-ship question has been even more grossly mishandled than the aircraft question, but eventually both will come into their own, and open warfare will result. The passing phase of trench war will then pass for ever.—C. G. G.]

AN ACADEMIC HONOUR.

The research medal awarded annually to an old boy of University College School for original work in any branch of experimental science has this year been granted to Captain and Flight-Commander Geoffrey Terence Roland Hill, R.F.C., attached to the Experimental Flying Department, whose researches have added in many important ways to the efficiency of aircraft construction. He is not only a scientific constructor of aeroplanes, but a practical pilot, and was awarded the Military Cross last October for having "attacked an enemy kite-balloon under very difficult circumstances, and continued firing until he was within 20 ft. of it. He was then only 1,000 ft. from the ground, and under heavy fire from anti-aircraft and machine-guns, but on looking round he saw the burning wreckage of the balloon on the ground."

Mr. Hill was unable to attend the prize distribution of University College School on Friday, and the medal was taken on his behalf by his father, Dr. M. J. M. Hill, Astor Professor of Pure Mathematics in the University of London.

PRESENTATION AEROPLANES.

Already 100 war aeroplanes have been presented to the R.F.C. through the instrumentality of the Over-Seas Club, General Buildings, Aldwych, W.C.2, and its members and friends in all parts of the world. On August 3rd, to mark the completion of the third year of the war, a cheque for £13,500 was handed to the Director-General of Military Aeronautics. This represents eight additional machines, namely :—

No. 101.—Mr. Walter Greenacre, of Durban.
No. 102.—"Shanghai Race Club No. 4," per Mr. H. H. Read.
No. 103.—"Hong-kong No. 7," given by Mr. A. R. Lowe, per Mr. J. J. Bryan.
No. 104.—"Hong-kong No. 8," per Mr. J. J. Bryan.
No. 105.—"The Henrietta," given by Mrs. Stromberg, New York.
No. 106.—"Chicago," from several Chicago citizens.
No. 107.—Christchurch branch of the Over-Seas Club.
No. 108.—"The Chiefs of Ashanti No. 3."

The money for these eight machines has been received during the past eight weeks, so that practically the Over-Seas Club and its members are adding one machine every week to the equipment of the R.F.C.

GALLANTRY REWARDED.

The following account from a "Times" correspondent supplements the story recently told in The Aeroplane of the heroism of the French Naval aviators who went to the rescue of British Naval aviators who were brought down off Zeebrugge, one of whom was ultimately captured by the Germans with the men whom he rescued.

The French Commandant, in writing to the captured Enseigne's father, described the son's conduct as heroic. The fire was terrific, the young man's action was watched with the greatest anxiety, and the escape of the whole party from wounds was miraculous. After speaking in the highest terms of the young officer's conduct, the Commandant added that, as orders had been disobeyed, it would have been necessary, had he returned, to place him under arrest. The further duty had remained to report his conduct, with the result shown in the orders of superior authority. These included an Army Order of the day, recounting the exploit, and adding a palm to the Croix de Guerre, already earned by the Enseigne, and a decree appointing him Chevalier of the Legion of Honour.

An order of the Minister of Marine of a few days later date promoted the Enseigne de Vaisseau to the rank of Lieutenant as a specially deserving case.

His services have also been recognised by the King, who has been pleased to create him a member of the D.S.O. and to confer upon his observer the D.S.M. The King has also conferred the D.S.M. on the crew of the companion seaplane.

The young officer is the son of a French nobleman of the South of France, connected with a British family well represented in the Services.

[It is curious that no mention of the incident appeared in the Press—other than The Aeroplane. There seems no reason why awards to our Allies should not be gazetted equally with those to our own people. The promotion and reward of the peccant aviator, following a reprimand for disobeying orders, is essentially French.—Ed.]

THE RAFANASIAN CREED.

Various inquiries as to the authorship of a particularly telling effort entitled "The Rafanasian Creed," which appeared in this paper some weeks ago, make it desirable to state that the "Creed" arrived anonymously from some person or persons unknown, and that, therefore, it is impossible for the Editor of this paper to give any indication as to the original perpetrator of the outrage.

A STRANGE CASE.

[The following strange case may not appear to have anything to do with aviation. Those who know will know, and others need not know. It is published in order to dispose of wild rumours.—Ed.]

On August 1st Mildred Deborah Platt, 29, of Buckingham Gate, appeared at Marlborough Street on a charge of stealing brooches, value £175, belonging to Joseph Chaumet, a New Bond Street jeweller. Other articles were found at her residence.

The accused, who appeared to be ill, was attended by a nurse.

Dr. Reginald Nitch-Smith, of New Bond Street, said he had attended the prisoner since January last, and had occasion to prescribe heroin for her. It was a drug taken internally or hypodermically, and belonged to the morphia group.

He had seen her on a number of occasions from January to July. He had never seen any ill-effects from the drug.

Mr. Gill said the accused was not in a fit state to give evidence, and she would hand a written statement to the magistrate.

She did so, exclaiming in a low tone, "I am not guilty."

Mr. Denman looked at the statement, making no comment.

Miss Mary Wilson, of Maidenhead, said she had been governess to the accused, who used to take heroin. At times she consumed a bottle of whisky or brandy a day.

Dr. Bulkeley Gavin said he had seen the accused many times. Owing to the drug he did not think she was responsible for her actions. He had done his best to prevent her obtaining it.

Dr. T. B. Hislop described heroin as a most pernicious drug, which robbed its victim of all moral sense. Accused was sent for trial, bail being allowed.

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PAGE & ROWLINGSON, Chartered Patent Agents (Consulting Engineer, Mr. S. E. Page, A.M.Inst.C.E.), 27, Chancery Lane, London, W.C. Tel. 332 Central.

Henry Skerrett, Chartered Patent Agent, 24, Temple Row, Birmingham.—Patents, trade marks, and designs.

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Sheet Metal Workers for aeroplane work. Men on Government work or residing over 10 miles away need not apply. Good wages. Apply personally at 10 o'clock any day to the Aircraft Construction Co., Harley Aeroplane Works, Beckton Road, E. 'Phone: East 1300.

Experienced Fitters and Erectors required for aeroplane work—large Government contract—only competent men need apply, and who are members of a recognised Trade Union. Good wages and conditions. No one already engaged on Government work will be engaged. Apply nearest Employment Exchange, mentioning this paper and Box No. 2022.

Wanted for aircraft factory near London, a thoroughly good engineering draughtsman, preferably one with aeroplane experience. No one residing more than 10 miles away or already engaged on Government work need apply.—Box No. 2016, The Aeroplane, 166, Piccadilly, W.1.

A large aircraft manufacturing firm, N.W. London, are in need of experienced draughtsmen for aeroplane design work. Permanent positions with excellent prospects. No person living more than 10 miles away or already engaged on Government work need apply.—Write giving age and salary required to Box 299, Sell's Advertising Offices, Fleet Street, E.C.4.

Foreman required, capable of taking charge of factory, making and assembling aeroplane units, such as wings and ailerons and elevators complete, including metal and fabric covered parts. No one residing more than 10 miles away or already engaged on Government work need apply.—Apply stating terms to Jas. Schoolbred and Co., Ltd., Tottenham Court Road, W.1.

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Test Pilot, 6½ years' experience of design, construction and flying, desires post.—Box No. 2023, The Aeroplane, 166, Piccadilly, W.1.

Engineer desires position as works' manager, technical manager, or superintendent. Has held equivalent positions with leading engineering firms. Special qualifications and credentials.—Box No. 2021, The Aeroplane, 166, Piccadilly, W.1.

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WEDNESDAY, AUGUST 15th, 1917.

The works may be viewed by appointment only, and particulars, with conditions of sale, had of Messrs. Roche, Son, and Neale, Solicitors, 1, Church Court, Old Jewry, E.C.2; of Messrs. Andrew W. Barr and Co., Chartered Accountants, 1, Queen Victoria Street, E.C.4; and of Messrs Fuller, Horsey and Co., 133, High Holborn, W.C.1 (temporary offices during repairs to Billiter Square).

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ON THE UNIFICATION OF THE FLYING SERVICES.

Under a new heading, but with the same hankering after ultimate perfection in the Flying Services, we may proceed this week to consider some further lessons of the past three years of war.

Of course it is obvious that the ideal air force would consist of a Unified Flying Service, embracing both the Royal Naval Air Service and the Royal Flying Corps under one omniscient and omnipotent head. Such a force would be mounted on aeroplanes of about four types, a small fighter, a bigger fighter, a reconnaissance machine, and a very big bombing machine. All these types would be standardised to the last ounce, each machine of a type would be exactly like its fellows, and woe betide the maker who dared to vary the thread of a screw, or a shade of pigment in the paint on any of his products. Every part of every engine would be absolutely interchangeable with like parts on every other engine.

Every pilot would be equally standardised. Each would weigh the same amount, so that every machine would have a like performance. Every pilot's legs would be the same length, so as to have a standard length between seat and rudder bar. We should evolve standards of audacity and of initiative, so that in action every pilot would behave exactly like every other. And so forth.

Every pilot would be trained in exactly the same way, so that every pilot would know exactly the standard amount about seaplanes and shore-going machines; flying over sea and over land; spotting for ships or spotting for artillery; bombing submarines, bombing ammunition dumps, bombing defended cities or bombing suburban residences; fighting aeroplanes or dodging Archies; taking photographs of trenches, shell-holes, battle ships or lady friends. Thus we should produce perfectly standardised pilots, fitted to man a unified Flying Service for operation on land or sea as might be required,—that is if the poor little beggars' brains would stand the strain without bursting. Anyhow, the standarised and unified pilot is just as attainable an ideal as is the unified and standardised Flying Service. And without the unified pilot I fail to see how the unified Flying Service is going to do its work.

Also the omniscient and omnipotent chief,—complete with omniscient staff, as fitted,—is just as easily attainable as are all our other ideals. But let us consider our Flying Service Ideals in the light of our three years' experience.

Specialisation versus Omniscience.

Now, one of the things which were for ever being drummed into us before the war was the doctrine of specialisation. We were bidden to take up one subject and specialise therein, if we wished to become successful. The ultimate evil of a man's career was that he should be jack of all trades and master of none, so we were told.

"Jack-of-all-trades" has been a term of reproach for centuries. Yet those who would have us unify our Flying Services have such faith in modern teaching that they would have us believe that we can produce aviators who are at once jacks and masters of all trades.

In the early days of the war, which were also the early days of flying, there was but little known about the science or practice of aviation. Under stress of war our knowledge increased rapidly, in spite of all hindrances, and as the aggregate amount of knowledge increased, so the difficulty of acquiring it all increased also.

In the early days one man might know all there was to know about piloting seaplanes or land machines, design, construction, and naval and military flying. As knowledge grew, the theory of design alone became, in many cases, more than one mind could contain. Construction alone also became enough to occupy a man's whole time. And naval and military flying expanded till either without the other demanded the whole attention of a really capable aviator.

It is true that one finds pilots who can fly the smallest and fastest fighter, or the biggest and heaviest bomb-dropper or seaplane with equal skill, but the mere art of flying is in itself the least part of a Service aviator's work. The more flying developed the greater became the need for specialisation, and the less possible became omniscience, even in this limited sphere of activities. Consequently we find already that aviators show more and more inclination to devote themselves to one branch of their particular Service.

Intensive Education.

For example, one finds pilots becoming specialists in air fighting, and, as a natural consequence, neglecting other sides of flying. Probably if one took a first-class fighting pilot and put him on to do ordinary reconnaissance he would fail lamentably, simply because in concentrating on all the tricks of the air fighter he had left himself no time in which to learn the science of soldiering, and so would know nothing about troop movements. Likewise he would probably fail completely as an artillery spotter.

Equally the first-class artillery spotter would fail as an air fighter, and all of them would fail as sea scouts if sent on a long patrol in a big flying-boat.

At the first meeting of the rejuvenated Aeronautical Society in January last, General Brancker in his admirable lecture on Training gave us a very good idea of the multiplicity of subjects which it was then necessary for the R.F.C. pupil to learn. Since that date still greater developments in air work at the front have taken place, and the amount to be learned has increased accordingly. Consequently there must be a stronger and stronger inclination to specialise as time goes on.

A Critical Point.

I make the suggestion with all humility, but I venture to ask those in charge of the training of aviators to consider very seriously whether we are not close to the critical point at which pupils are expected to learn too much. Pilots are needed in thousands, some for fighting machines, some for reconnaissance machines, and some for bomb-droppers,—those are practically the three specialised classes, the other phases of aerial activity come practically under one or other of those heads. Might it not be wise to give a pupil, or a cadet, on joining the option of choosing the class in which he would specialise?

It seems possible that a specialist in bomb-dropping, for example, would be better at his job, and would be more quickly trained, if he were left entirely ignorant of fighting tactics or of reconnaissance. Thus the total output of pilots might be increased, and the efficiency of each in his own line might also be increased. Complete knowledge of his own job might well make a man more valuable than a smattering of so many different subjects as he has to learn.

For example, the pilot of a big bomb-dropper has entirely wasted all the time which he has spent in learning about rotary engines, photography, troop-movements and reconnaissance generally, machine-guns, and so forth. That time might have been better spent in increasing his knowledge of ballistics, as applied to the fall of bombs, and in studying the behaviour of big engines, and the science of navigation.

Please do not think I am in any way criticising the system of Home Training, as hitherto carried on, for it has been marvellously efficient and at the same time effective. I merely wish to suggest that perhaps the time has come for still further specialisation, purely as a war measure.

So long as the training of young pilots remains in the hands of the officers who have been responsible for it during the past year or so, it is happily possible to look to the future with complete equanimity.

Possibilities of Error and Correction.

Naturally such specialisation as I have indicated might lead to some errors of judgment. For instance some youngster, full of ambitions towards M.Cs. and D.S.Os. and consecutive bars, might choose the air fighting course, and turn out to be utterly ham-fisted, and incapable of handling a fast fighter, yet he might have plenty of pluck and endurance, and be an ideal pilot of a big many-hundred-horse bomb-dropper. It should not be difficult to shunt him back to the next bombing class as soon as his failing was discovered, and he would only suffer to the extent of having his seniority in the Corps decreased by the time he had wasted in the wrong class.

At any rate it might be better than the kind of thing which occasionally happens to-day, where a pupil who shows that he has good hands is put on to fast fighters, whether he likes it or not, and discovers later that though he can fly anything, he cannot do the loops and corkscrews and "split-air" spirals and spins necessary in air fighting, simply because his inside will not stand it. The late Gustav Hamel, for all his trick flying, was frequently seized with air-sickness, and his best tricks were merely the elementary evolutions of every fighting pilot of to-day. I know of similar instances where sheer delicacy of their internal economy prevents otherwise excellent pilots from continuing as fighting pilots. Yet, apparently, instead of sending them back from the front for a refresher course of training in reconnaissance or bombing, it seems that such cases are liable to be turned over to become infantry officers, thus wasting all the time and labour spent in teaching them to fly.

To Save Waste.

I venture to suggest that unless a pilot has a black mark against his character, or unless he is proved incompetent, his flying knowledge should not be wasted. Also, I further suggest that no pilot should be turned down on the report of one senior officer, for it takes two to make a quarrel, and the man who cannot work without disturbance under one senior officer may work quietly and brilliantly under another.

Undoubtedly sheer incompatibility of temper has cost us quite a number of very good fliers, and there was more than a little sense in the suggestion made in the House of Commons recently that special squadrons should be formed of pilots who have been turned out of the R.F.C. because of rows with senior officers, and who do not want to give up flying. A strong but sympathetic senior officer might do a great deal with these "difficult" characters. The French have their way of handling them, and before the war the *Légion Etrangère* was full of them and their like.

It is rather a pity we do not pay more attention to matters of psychology. I can name off-hand three or four men who have been turned out without any really serious charge against them, and simply because they were a bit of a nuisance, yet I would guarantee to get valuable work out of any or all of them. They are quite good chaps at heart, though they would certainly be a nuisance to some people, especially the stodgy and solid sort, yet with proper handling they would be really useful.

The School of Experience.

However, I am getting rather wide of my purpose, which was to discuss the question of unification of the Flying Services. So far I have endeavoured to show how the tendency to specialise is increasing. It must be fairly obvious that the greater the specialisation the less is the possibility of producing aviators who could operate at will with either the Navy or Army.

The obvious reply of the ignorant is to point to the R.N.A.S. bombing squadrons in Flanders and the R.N.A.S. fighting squadrons, and to quote the high praise they have won from the Commander-in-Chief of the British Armies in France. The equally obvious answer, from anyone who knows, is that these gallant young gentlemen are not Naval aviators and are not Army aviators. They are simply highly efficient specialists in bomb-dropping and air fighting. They happen to have been taught to fly by the R.N.A.S., and they happen to be paid by the Admiralty, but what they know about bombing and fighting they have taught themselves.

The senior officers of those detachments have been so long in France that they have learned their jobs in the same school of experience as that in which the R.F.C. pilots have learned, and that experience has been handed back to R.N.A.S. schools at home, so that their newly joined subordinates are taught on their lines. But none of the work done by these detachments has anything particular to do with Naval aviation as such.

The "Giddy Harumphrodites."

They measure their speed in knots, which complicates comparison of their performances with those of the R.F.C. They talk about "going ashore" when they leave their aerodromes for a little relaxation in the nearest town. They call the car that takes them there the "leave-boat." They wear Naval rank-stripes, plus the new R.N.A.S. rank-stars, on a khaki uniform, which resembles that of a soldier. They measure time by "bells" and "watches," which also complicates co-

operation with the Army. But they are neither Naval nor Military aviators.

Comparisons are odious, but it seems possible that in their own jobs as bombers and air fighters they are perhaps a trifle superior to the average of the R.F.C., not because they are individually superior—they would be the first to resent any such claim—but just because they are specialists, and have not had to learn any part of the Navy's job or of the Army's job in addition to their own.

One cannot say that none of them has done any reconnaissance, because one knows something of their photographic work, but in this branch again the work is done by specialists, and the time in which this superphotography has been developed has been so short that any really brainy man who has specialised on it has got as far as any other. And, furthermore, aerial photography is not exclusively the job of the Navy or of the Army, but is common to both. Nevertheless, the information deduced from those same photographs would probably differ very considerably according to whether they were studied by a sailor or a soldier, or by an aviator who was neither.

Naval Aviation.

Having considered briefly the work of Military aviators and of R.N.A.S. aviators, whose work is strictly neither Naval nor Military, it may be well to point out what is really the work of a Naval aviator. At present, if one may judge by occasional brief paragraphs in the daily news-sheets, the R.N.A.S. proper is somewhat intimately concerned with the anti-submarine campaign which is being carried on with varying success by what one may call the *guerilla* branches of His Majesty's Navy.

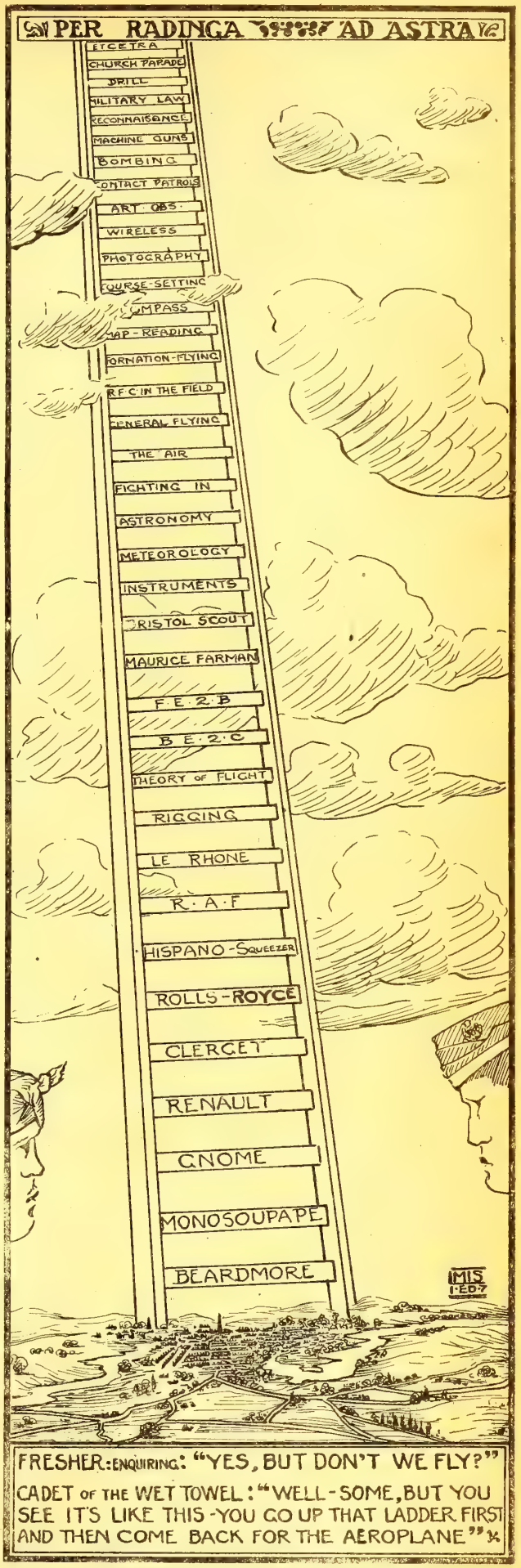
It is fairly evident that such work distinctly calls for specialists. Doubtless bomb-dropping and machine-gun work comes into the operations, but both in ways very far removed from those practised by the R.N.A.S. bombers and air fighters in Flanders. Moreover, the seaplanes used in these operations differ materially from the machines used in Flanders, and call for specialist pilots.

Your first-class pilot of a big bomber would find himself very much at sea, in all senses, if called upon to bring a huge flying-boat, or a twin-float seaplane, smartly alongside a jetty, or to the end of a slipway, with a strong side wind blowing across a tide-rip. Your pilot of the small fast single-seat fighter would be equally puzzled to bring a "Schneider," or a "Baby," or an A.D. boat alongside a ship, preparatory to being hauled inboard by a derrick. Both would have to learn something of seamanship, as well as learning airmanship of a kind entirely different from that to which the over-land pilot is accustomed.

Furthermore, this 'long-shore submarine-chasing phase of flying is closely allied to the work which will have to be done by pilots operating on the High Seas in such time when the Fleet takes the Royal Naval Air Service to its bosom and regards it as an integral part of the British Navy, as it will do some day. Only probably by that time we shall have only submersible battleships, and our seaplane motherships may then launch their air scouts by the simple process of sitting them on deck and leaving them afloat when the ship submerges.

A Childish Fancy.

There was a time—some four and a half years ago—when I strongly advocated in print launching aeroplanes by catapult from the fore-decks of ships. The fuselages of the machines were to be unsinkable, and they were to be hauled aboard any old how when they



The R.F.C. Cadet's Progress at Reading.

flopped into the water alongside on their return. In the light of later knowledge, and of the development of submarines, this process now seems insufferably crude and out of date. I can only plead that progress has been rapid since I held those elementary views, and that the process would have had some practical use if it had been put into operation just about when war broke out—as it might well have been. To-day, of course, it would merely seem childish to anyone with any considerable knowledge of modern possibilities.

The Real Naval Air Service.

In those days to come the real Naval Air Service will be as far remote from over-land flying as the Navy to-day is from the Army. The Naval aviator will be merely an officer of the Navy who flies, and will be a specialist of the Navy in the same way that the gunnery jack, and the torpedo lieutenant, and the navigator is a specialist, as distinct from the watch-keeper. The simple act of flying will be only a part of his job as a sailor.

Possibly I am lacking in imagination, possibly I am growing old and conservative in my notions, but I fail utterly to see how the real Naval aviator can possibly be a member of that unified Imperial Air Service which so many well-meaning people wish to bring into existence.

The Artillery Aviator.

In a somewhat analogous way there seems good reason to argue that the Army aviator of the future must be wholly a soldier if he is to be efficient at his job. In my ignorance of military detail I may be wrong, but it appears to me unlikely that a forward observation officer, or F.O.O., as he is generally called in these alphabetical days, is other than an officer of the Royal Regiment of Artillery.

There is, it is true, a story of a sporting infantry private who was borrowed by a gunner F.O.O. to act as telephonist, owing to his own man being knocked out. The battery was endeavouring to bring down a house which was stiff with machine-guns, and the infantryman was so interested in the job that he kept on popping up his head to watch the result of each shot, instead of merely waiting for the F.O.O.'s corrections. Finally, a shell plunged straight into the house, whereupon the telephonist, in his excitement, yelled into the transmitter, "Right through the bally window! Will you have a cigar or nuts?"

One gathers that though the battery commander was pleased with the result, he did not approve of the method of conveying the information. The moral seems to be that the specialist's job should be done by a specialist.

It seems, therefore, rather as if the artillery observation aeroplane should be simply a vehicle conveying a gunner officer, instead of a machine and crew belonging to another Corps, lent for the occasion. Without in any way detracting from the magnificent work done by the art. ob. machines of the R.F.C., perhaps one may submit the suggestion that still higher efficiency—if it be possible—might be reached if each artillery brigade had its own art. ob. squadron, as an integral part of the brigade, just as it has its own ammunition column and transport.

Probably, art. ob. squadrons R.A. would be smaller than the regular R.F.C. squadrons, but every man would be a specialist. Doubtless, the *personnel* would be taught to fly by the R.F.C., but, thereafter, they would be officers and men of the Royal Regiment of Artillery, unless the R.A. set up flying schools of their own, as they have their own riding-schools apart from the Cavalry. The arrangement would make for *esprit de corps*, and would certainly maintain the highest level of efficiency.

The Work of the R.F.C.

Similarly the work of the R.F.C. proper would continue to be wholly military. Reconnaissance is pre-eminently work for a highly trained soldier, and not for an air-fighter or bomb-dropper. The corps squadrons of the R.F.C., to be efficient must be highly trained in military science. A successful military photographer should know what to photograph, and not merely how to photograph it. If not, it would be just as well to send a member of the staff of one of the cheap illustrated news-sheets with which we are afflicted as to send a military aviator to do the work.

Military Bombing.

Also, for bomb-dropping within what the French call the zone of the armies, as distinct from bomb-dropping raids in the enemy's country, real military knowledge is essential if bombs are not to be wasted on useless objectives. Even to-day bombing is not taken as seriously as it deserves to be, and until comparatively recently it was the most amateurish branch of our military operations, chiefly, I believe, because so few professional soldiers had time to spare for the study of the subject.

Any machine capable of lifting a hundred pounds or so of extra weight was a good enough thing to which to attach a few bombs, which bombs were generally placed so as to retard the machine's progress considerably. The French first paid serious attention to bombing machines, but the Germans were the first to develop the big bomber as a specialist's type, and to make important use of it.

It is still hard to induce the young and ardent pilot, whose idea of an aeroplane is the biggest possible engine with the smallest possible fringe of aeroplane round it (acknowledgments to F. S. B., who coined the phrase), that the aerial "tank" has its uses. He feels acutely miserable on a vast platform which cannot dodge, and he forgets that it can defend itself.

Very few R.F.C. pilots, and probably not many senior officers of the R.F.C., have seen big bombers in action, but those who have seen them are full of respect for them. And those who have fought them hold them in still greater esteem. The mere London mob, as a matter of fact, probably knows more about the virtues of big bombers than do the active-service pilots who condemn them so freely. Possibly, however, the limited output of real bombing machines, owing to the greater need for other types by corps squadrons, is largely accountable for the prevailing ignorance of their capabilities. Therefore we are the more indebted to the Germans for the education they have provided.

As to the army squadrons of the R.F.C., as distinct from corps squadrons, they alone of the R.F.C. personnel need but little real military knowledge, being concerned with fighting rather than with any directly military operations on the ground.

Is Unification Possible?

From this somewhat lengthy, and yet extremely superficial, review of the duties of active-service aviators one sees that either Naval or Military knowledge is of greater importance than mere knowledge of flying. If one had time and space in which to go more deeply into the subject, and if the necessity of withholding information from the enemy did not prevent discussion in detail, one would doubtless find good proof that the more the work of the two Services is studied and developed, the greater must be the divergence between Naval and Military aviation, not only in the training of the personnel, but in the actual design of the machines.

Leaving the question of machines aside for a further discussion, and considering personnel only, I fail entirely to see how any unification of the two existing Flying Services is possible. If anyone can give me any argument in favour of a single Air Service, I shall be extremely grateful, for I should like to agree with sundry valued friends of mine who are ardent advocates of a single service.

The argument that water is one element with one service, and land is another with another service, and that the air is a third, and therefore must have a separate service, is only partly valid. One might equally well argue that no sailor should ever fight on land—generally it is as well that he should not—and that no soldier should ever run a boat—though, in fact, the War Department run their boats excellently. The fact is that air is the common property of all, therefore aerial vehicles may convey either sailors or soldiers upon their lawful occasions.

There is as good reason for arguing that the Royal Regiment of Artillery should man and operate the guns of the Fleet—not but that they would make a first-class job of it—as for arguing that the Imperial Air Service should do all the air work for Navy and Army alike. Even supposing that the Royal Artillery made better shooting than do the gun-layers of the Navy, does anybody who knows the Navy imagine that such an arrangement could possibly work? How, then, can an Air Service which is neither Navy nor Army work with both?

It is admitted, even by the advocates of a Unified Air Service, that after the elementary stages of flying are passed the young aviator would have to devote himself entirely to either the Naval or Military Wing. What, then, is the advantage over making him outright an officer of one Service or the other? The disadvantages of making an Air Service officer in, but not of, either of the other Services seem too obvious to need argument. Consider the status of a Marine on board ship for a simple example.

The Imperial Air Service.

There are, however, sound arguments in favour of an Imperial Air Service, entirely separate from the Navy and Army, and operating in conjunction with either, just as the two Services co-operate when required to-day. We have the embryo of such an Air Service before us in the non-Naval squadrons of the R.N.A.S. to-day. And we have had examples of the possibilities of such a Service in the German air raids on England.

As I have already demonstrated, the R.N.A.S. squadrons in Flanders have been doing Air Service work pure and simple. The bombing squadrons have materially deteriorated the German raiding squadrons detailed for attack on England. In this respect they have assisted our Home Defence Forces. They have also bombed German Naval points on the Belgian coast, and so have assisted the Navy. They have carried out other bombing work to assist the Army in Flanders.

In the Balkans R.N.A.S. bombing detachments have assisted the French, British, and Servian Armies. And they have bombed Constantinople, which was neither Navy nor Army work, but pure Air Service work, which, if carried on sufficiently, would help materially to get along with the war.

Similarly, the fighting squadrons of the R.N.A.S. in Flanders have attacked and brought down raiders bound for or from England, as well as Dunkirk, Calais, Boulogne, and elsewhere. Thus they acted as air guards for England, and for Naval and Military points in France as well. Others have acted as army squadrons for our troops in France, as well as providing air fighters in the Balkans and elsewhere.

In none of these activities have they been either purely Naval or purely Military units, and for none of this work did the personnel require any Naval or Military knowledge. They did absolute Air Service work as specialists, and in that particular phase of war their knowledge is as great as that of any people living.

Future Development.

Here, then, is the line along which the present advocates of unification had better expend their energies, for in this direction lies the future development of the Imperial Air Service. The nucleus of senior officers must of necessity be sailors and soldiers, but the rest of the personnel should be neither. There are plenty of experienced warrant and non-commissioned officers and men—as experience goes in these days—who are at present nominally in the Navy or Army, but who are really heart and soul Air Service. A certain number of them would willingly be transferred to the new Service, and the bulk could be made up from youngsters just reaching military age, and from the Colonies.

It may be assumed at once that both the Navy and Army want more men than they can get. The Army would gleefully enlist the whole personnel of the Fleet if given the chance, and the Navy would equally gladly turn the whole Army into sailors if it could prevail upon the War Cabinet to stop wasting money on shells and guns and things for the Army and put that money into ships on which the new Navy could be embarked. Each Service very naturally and rightly regards itself as the one and only indispensible.

Just so the Air Service advocates think that the war will be won in the air. It is well that they should think so, for it gives energy to their efforts. The fact that the war cannot be won without a flat-footed Army of Occupation in enemy territory, and that the said Army cannot be transported and fed overseas without a Fleet, may escape their notice, and may make them look a trifle ridiculous in the eyes of the less enthusiastically or more logically minded, but one would not for worlds damp their enthusiasm.

Enthusiasm Over-run.

The other evening I heard one of our latter-day prophets, who has long prophesied vaguely the coming of Aerial Supremacy, and who is a prophet with considerable profit in this his own country, telling a distinguished gathering how in France he passed through mile upon mile of horse camps. Being merely an inspired ass, and not even temperamentally a soldier, he boldly advocated that all the money, and labour, and transport involved in obtaining and maintaining these horses should be turned onto increasing the Air Service.

He quite omitted to say how A.S.C. horse transport is to be worked, or how mounted infantry is to operate if open warfare eventuates, or how our armies of pursuit are to get along when the great opportunity for the *arme blanche* occurs, as it will some day. Nor did he explain how infantry majors, and padres, and such persons of importance, are to be conveyed with due dignity—if without comfort.

He talked glibly of Third Dimension Cavalry—my old jest of two years ago—and imagined that because aeroplanes can go where the woolly horse cannot go, therefore aeroplanes can replace the woolly horse everywhere. As a matter of fact, despite all our motors, and caterpillar tractors, and tanks, and aeroplanes, there are many occasions on which our well-tried four-legged friends can and will beat the lot, so do not let us permit our enthusiasm to over-run itself.

An Immediate Decision Needed.

There is a definite need for an Imperial Air Service, and it is for the War Cabinet, or whoever really rules the Nation, to decide the priority of that Service. Eventually it will be far bigger than the Navy, because it will be more essential to the Empire's safety. But it will be smaller than the Army, because the man with a rifle in his hand is the person who ultimately wins a war and keeps it won. At present the problem is to decide which Service shall have the prior claim on men, material, machinery, and labour.

Obviously the Army has first claim. The Navy is strong enough for the purposes of this war, so far as the present obsolescent surface-ships are concerned, but obviously the Submarine Service deserves to be developed to its utmost. The Air Service should ultimately be bigger than the R.F.C., but until the Army is reasonably well equipped with aircraft nothing much can be done for the Imperial Air Service.

Nevertheless, now is the time, while the Public, and therefore the politicians, are interested in aircraft, to form the beginnings of the new Air Service. If a reasonable allocation of material and personnel be decreed for that Service, and if a capable man be put in command, it should be possible in not less than six months, and not more than twelve, to stop all air-raiding into England, and to carry the air war into the enemy's country with such results as materially to affect the issue of the war as a whole.—C. G. G.

An Episode of Life.

On occasion it is good that people should see themselves as others see them. None can accuse this paper of having unduly advertised the heroism of flying officers, for it has been felt that constant glorification is apt to turn the heads of the young, and so one has said much less than one has felt of admiration for those on active service. Therefore one may perhaps be forgiven for presenting to our active-service pilots a little story showing them how they are regarded by those at home whom they have the honour to defend:

Marguerite Patricia Harrison was a typical English girl of that healthy country-bred type which is one of the finest possessions of this nation. Like so many of her sex, she took the keenest possible interest in flying, even before the war, and, living as she did on the route between two important aerodromes, she saw much of machines and pilots. When war came, she was only twelve or thirteen years of age, but she followed the work of the Flying Services with the closest attention, and her admiration for the men who flew so gallantly was boundless.

Some few weeks ago it became necessary for her to undergo a minor operation, ordinarily of no consequence. She had no fear of the operation herself, and proceeded to take the anæsthetic cheerfully and confidently. From that sleep she never awoke.

When her parents came to look through her little belongings they found that the day before the operation—as if she had a premonition of her fate—she had written a farewell letter, disposing of her property among her friends. In this letter was a short note addressed to the officers of the Flying Services, which she so much admired, and a request that, if possible, it should be conveyed to those for whom it was intended. One has therefore the privilege of doing so. The note reads thus:

"To all the officers of the R.F.C. and R.N.A.S.—I wish to thank all of you brave and gallant officers of the R.F.C. and R.N.A.S. for the great work you, each one of you, are doing, giving your dear brave lives to King and Country.

"I have a wonderful admiration for the R.F.C. and the great work it is doing, and also for the R.N.A.S. The young aviator, always ready for work, up at half-past two at the front, just comes down for mess, and, if the 'bus is damaged, hops into another and off over the enemies' lines again.

"Once more I thank you for the great work you are doing, and I wish very, very good luck to you all.—(Signed) Marguerite Patricia Harrison.

There you have in simple girlish language the heartfelt thoughts of many a little maid whose gentle home life is being preserved to her by our troops on active service. We cynical newspaper people have an axiom to the effect that for one person who writes a letter there are a thousand who would like to do so if they could take the trouble to collect the writing material. In such an extraordinary case as this, one may safely say that millions think as poor little Marguerite Patricia thought, and one hopes that the knowledge may help those youngsters, many of them little more than children themselves for all their brave affectation of disillusioned manhood, who are working and suffering on active service.

One reads much of brutal labour discontent, of heartless financial profiteering, of cynical political graft, so it is good at times to realise that there is still purity and innocence in the country for which one is fighting.—C. G. G.

AIRCRAFT DAMAGE TO CROPS.

At a meeting of the Wiltshire War Agricultural Committee at Trowbridge, Mr. Gordon Redman, of Collingbourne, drew attention to the grave risk of farmers in regard to their crops in the neighbourhood of aerodromes through damage by aircraft. He did not think farmers understood the position. The War Department accepted no liability for direct or indirect damage by aircraft, which, in a county like Wiltshire, was a serious matter. One farmer in twenty did not know that, if aircraft dropped in a field of wheat and burned up twenty acres, he could get no redress whatever. He admitted that there was a scheme of insurance, but it was extraordinary that, while the War Office acknowledged responsibility for damage done by troops or artillery, no such liability was admitted in regard to aircraft.

Mr. E. G. Warren, farmer, South Wilts, said that an aircraft dropped in one of his fields, and while it did no damage, the officer in charge said he was in a position to negotiate with the owner if damage had been done.

Mr. Redman said he had had several down in his fields, but the damage having been but little, he had made no claim. There was no doubt, however, that an order had been issued to the effect that no such claims for damage were allowable.

An instance was given where aircraft had dropped in a field of wheat in the county, and half-an-acre of the crop had to be cut to make room for it to be got out. In that case, the officer authorised the owner to send in a claim for £10. That so far had not been paid, but payment was not refused.

Mr. Redman quoted a case in which a claim for £4 was sent in last November, and up to now it had been refused.

Mr. Arthur Stratton (President of the Local Branch of the National Farmers' Union) pointed out that more damage to crops was done by the people who flocked to see aircraft on the ground than by the aircraft itself—a fact which was confirmed by another farmer who had suffered in that way. It was decided to make inquiries as to the legal position in regard to compensation.

WAR WORK.

An opportunity is afforded by the Middlesex Education Committee at the Willesden Polytechnic, Kilburn, to capable women between the ages of 18 and 35 to receive a month's training in woodwork for aeroplane factories. During this period they are paid 15s. a week, and afterwards they are drafted into factories, where they receive a minimum wage of about 25s. to 30s. per week to commence with.

OFFICIAL DESIGN.

BY "BERKELEY."

Throughout history there has been a constant and ever vivid rivalry between private and public enterprise. The rulers and the ruled, often in complete concord when the affairs of other States hold their attention, are rarely joined in entire amity over the internal economy of their own country. The people of France lived in the warm splendour of the military genius of Louis XIV and acknowledged the reflected glory. It was their blood and their money that made the tools of victory, but it was his mind and his inspiration which directed the tools in their perfect work.

Nevertheless, the people did not so readily admit his inspiration when local drainage schemes held his attention. It is one thing to die in gracious heroism in a far country for the honour of France—it is quite another thing to live throughout the prime of mortal life in all the glowing richness of an undying smell.

The Official Ark.

Noah, who "was a just man and perfect in his generation," designed by the aid of divine inspiration an ark of vast dimensions, that in the day of trouble he might live in security on the face of the waters. He was no member of the official caste, and it can be assumed that he received no official support in the perfecting of the design of his ark.

Officialdom probably wrangled over the factor of safety proper to a government ark. Hence, when the floods rose in their majesty, officialdom and its followers drowned in a misery only relieved by the thought that, though death had come to them, their theories of ark construction had been put to no disproof.

Official Inquisitors.

And so through the later ages. Intellectual Spaniards, unwise in their generation, who with misguided brilliance invented things of note without the official seal of approbation, ended their lives in ecstasies of flaming bliss under the fell sentences of the familiars of the Great Inquisition. In England the people did not burn their inventors—they merely laughed in pleasant derision, a more certain ending than all the torture devised by the twisted thoughts of humankind.

It has always been a long and dreary battle before the skill of a man has been permitted to bring vigour and freshness of thought to a proper stage of success. Novelty is pleasant in amusement, but it is unforgivable in the serious walks of existence.

Official Justification.

Nevertheless, the paths of officialdom are proper to be trod by those who desire ultimate and continuing success, if the manner of tool to be designed and produced intimately concerns the art of war.

In all warlike things secrecy is an essential element of success. To whisper abroad the mysteries of the mental skill of the nation's war-wizards is to court that measure of defeat in the field which may be splendid to remote posterity, but is grimly disastrous to the immediate present. Had Germany in all sincerity told us of her designs in the use of artillery before the sunshine of August, 1914, the early days of this present war might have been different. But she is not skilled in that manner of unwisdom. Silence is a splendid virtue banished from England by the Stock Exchange and the Palace of Westminster.

The Official Mind.

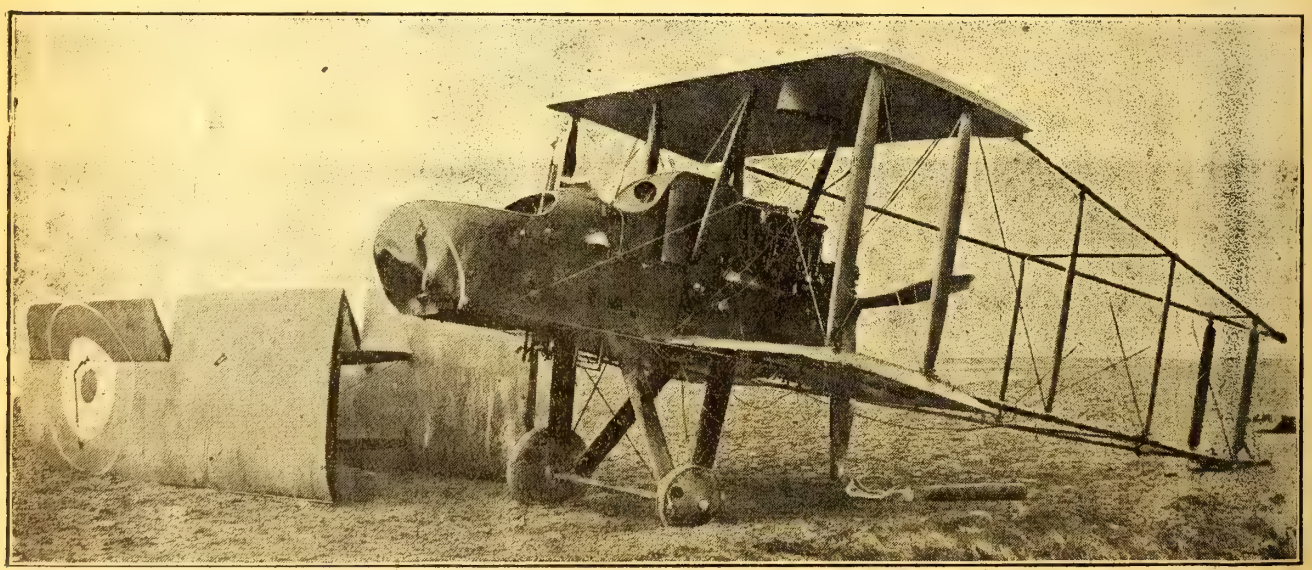
Each great step in an industry concerning war has been trodden by the unofficial dreams of genius, but each step has been consolidated by the perseverance of the slow official mind.

Steam power was thought out in no Government office. The screw succeeded the paddle in the propulsion of steamships through no activity of the official brain. The turrets which to-day are an integral part of all large ships of war were designed by a simple captain in His Majesty's Navy. The submarine itself probably came into being from the disordered dream of a dyspeptic American.

But each of these inventions attained perfection not in the hands of civilian designers but from those who were employed as public servants.

Official Custom.

To-day it is not customary, when it is desired to increase the fleet by a number of battleships, to put out the designs to public tender. The main features of the design are drawn out in the allotted Government office, and are finally amplified in the drawing offices



IN THE HANDS OF THE ENEMY.—An Officially Designed F.E. Biplane, photographed as taken apart for transport, after being captured by the Germans. The front of the nacelle suggests that the machine stood on its nose in landing.

of the firms which have been selected to fulfil the contract. The very firms which are employed in the construction of munitions of war (in times of peace) are themselves, by reason of the work, in a sense official.

Official Aeronautics.

In aeronautics the same rules will apply as time passes by. To-day and in the past the whole science is in its infancy, and the great question at issue is the production of any aeroplanes that will fly. For the time being military and commercial interests are the same, in so far as aircraft are concerned. Neither the distinctive military aeroplane nor that proper for commercial use has as yet been either designed or constructed.

All aeroplanes of the present day possess attributes which make them of equal use in peace or war. If in the course of the next few months the war should end, any aeroplane now employed on military duties would, by the removal of such decorations as give it its likeness to a Christmas-tree, become a machine in which pleasure flying could be carried out both with happiness and success.

Official Requirements.

As time passes, all this beautiful simplicity of design will end, and attributes of more strict application to the work in hand will be required. An aeroplane will no longer be inherently suited for war merely because it flies swiftly or climbs with astounding celerity. For warlike purposes it will of necessity possess points of design which will peculiarly fit it for the work in hand.

A reconnoitring aeroplane will differ in essential detail from machines designed for aerial fighting. Those aeroplanes which are intended to drop bombs in enthusiastic and accurate profusion over all parts of the enemy terrain will be of high value for that purpose and for that purpose only.

Official Specialisation.

None would think of asking a battery of artillery to act temporarily as a battalion of infantry, nor will any future general gifted with rudimentary sanity employ his fighting aeroplanes as spotters for his guns.

[One regrets that exigencies of modern war under improper official preparation have resulted in cavalry being used as infantry, aeroplanes as cavalry, infantry as sappers, and "tanks" as cook-shops and canteens, but these unavoidable departures from their specialised purposes are the exceptions which prove the rule, as laid down by "Berkeley."—Ed.]

Each aeroplane will have its place, and will be designed and built to fill that place with efficiency.

Until this stage of efficiency has been reached, the development of aircraft will remain in the hands of the private designers, assisted by the accumulated experience of the active-service pilots and by the conservatism of official brains. The eccentricities of the Royal Aircraft Factory may in the memory add to the gaiety of communal afternoons in the country, but there is little doubt its designers have assisted greatly in the development of aeroplanes, sometimes by mental brilliancy and often by charming and interesting mistakes.

Official Control.

In the future the paths of peace and war in the design and production of flying machines will divide. The civilian designers and the commercial aircraft companies will supply such aeroplanes as may be desired in sport and commerce, but an official designing office and a body of selected contractors will control the production and development of the aeroplane of war. This latter type will by then differ as greatly from commercial aircraft as does a cargo vessel from a T.B.D.

The armour, the gunnery arrangements, and the bomb-dropping devices will each be as secret, or as little secret, as are the internal parts of a present-day warship. It will not be for the common herd to talk with light and inaccurate knowledge of the secrets of the air battleship of the day to come.

Official Technicalities.

The mass of technicality peculiar to this class of work will grow rapidly, until everything concerning the production of warlike aircraft will be as highly specialised and as exclusive in outlook as a German guild in the Middle Ages. A separate branch of it may, perhaps, be called the profession of aerial architecture.

The section of the Air Services set aside for this work may, perhaps, draw its personnel from the drawing offices of the great aircraft companies, but it will, in addition, assuredly train a very large proportion of its staff from adolescence to storied age.

Official Evolution.

Each type of craft, having its own peculiar features of design, must be designed by those whose experience best qualifies them for the work. Progress in such matters depends much more on natural development than on the individual efforts of heaven-sent genius.

Each machine as it is put into use is found wanting in some manner. In the next design the modification or development suggested by experience should be included. And so the process of evolution passes on.

The Official Future.

Such points of value as may be produced by the companies producing aircraft are not to be ignored. Great changes in system are invariably the result of natural genius, and natural genius does not always rest in the gloom of a government office. The use of iron and of steel in ships of war followed the practice common among commercial craft. The turbine was invented by a civilian distantly connected with naval construction.

If these arguments have anything in their favour, it should be clear that in the future the development of military aeronautics, in so far as design is concerned, will lie in the hands of a government office, assisted by the great contracting firms.

THE LATEST RAID RESULTS.

The Press Bureau issued the following communiqué on August 13th at 8.20 :—

The reports of the pilots show conclusively that the enemy aircraft formation which attacked the East Coast was making for London. On sighting the large number of our aeroplanes which were sent up against them, they turned abruptly and made the best of their way out to sea again, dropping some bombs at Southend and unloading the rest when out at sea. The action of the anti-aircraft guns was of great assistance to our fighting squadrons.

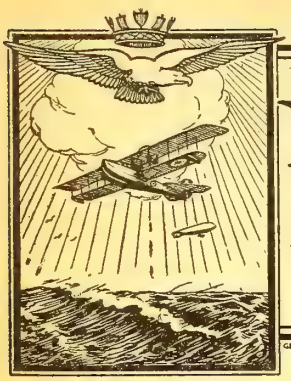
The casualties at Southend have been finally established to be as follows, states an official report :—

Killed : 10 men, 13 women, 9 children—total 32.

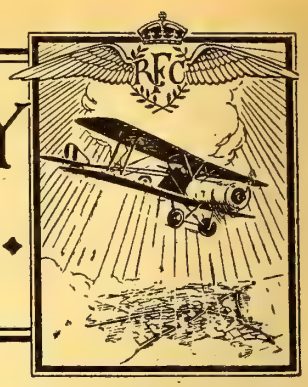
Injured : 13 men, 18 women, 12 children—total 43.

[It is distinctly a pity that the first announcement of the raid did not note the fact that the German raiders were driven off by the strong formations of defensive aeroplanes which met them on their way to London, as the Home Defence Forces would then have received due credit for their excellent work. Instead of this there was a tendency to jeer at a defence system which allowed the enemy to escape without loss. The machine brought down was not sunk by the R.F.C. Home Defence Wing, and therefore that excellently organised force was deprived of the credit which is its due.

One is doubtful whether one ought not to decry our Home Defence arrangements in the hope of luring the Hun to destruction, but a regard for accuracy, greater perhaps than that suggested in some official communications, compels one to say that aeroplane and gun defences and observation system are all alike of high excellence, and, if towns on the East Coast are occasionally discommoded, that is but the penalty of fame, owing to their being in the war area. Their discomfort will doubtless cease when serious retaliatory raids on Germany begin.—C. G. G.]



NAVAL and MILITARY AERONAUTICS



FROM THE "LONDON GAZETTE."

Admiralty, August 2nd.

R.N.A.S.—To be temp. Obsr.-Lt. :—G. H. Millar, June 17th.

August 6th.—Temp. Flt. Sub-Lt. to be temp. Flt. Lt. :—W. H. Mackenzie, June 30th.

Admiralty, August 4th.

Temp. Flt. Sub-Lts. specially promoted to temp. Flt. Lts. for meritorious war service :—J. A. Glen, H. F. Beamish, Aug. 5th.

War Office, August 6th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing. —Flt. Comdrs.—From Flying Officers.—Capt. J. Everidge, Yeo., T.F., July 17th. Lt. O. Stewart, Mx. R., T.F., and to be temp. Capt. whilst so empld., July 19th. Temp. Lt. H. M. Ferreira, Gen. List, and to be temp. Capt. whilst so empld., July 21st. Temp. Capt. J. Leacroft, Gen. List; and to be temp. Capts. whilst so empld. :—Temp. Lt. A. E. Charlwood, Gen. List, temp. Sec. Lt. E. Mannock, R.E., July 22nd. Sec. Lt. P. G. Taylor, Spec. Res., July 23rd.

Expertml. Officer, 1st Cl.—(Graded as an Equipment Officer, 1st. Cl.).—Temp. Lt. D. P. Geddes, Gen. List, from an Equipment Officer, 2nd Cl., and to be temp. Capt. whilst so empld., July 6th.

Memorandum.—Actg. Sgt. Maj. J. McDonald, from R.F.C., to be Sec. Lt. for duty with R.F.C., June 6th (substituted for notification in "Gazette" of July 2nd).

* * *

The King has approved of the award of the Military Cross and Military Medal respectively to the following officer and non-commissioned officer in recognition of conspicuous gallantry and determination displayed in connection with the destruction of an enemy airship :—

Sec. Lt. (temp Lt.) Frank Douglas Holder, E. Kent R., and R.F.C.

No. 566 Sgt. Sydney Ashby, R.F.C.

War Office, August 8th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing. —Wing Comdr.—Capt. (temp. Maj.) A. J. L. Scott, Yeo., T.F., from a Sqdn. Comdr., and to be temp. Lt.-Col. whilst so empld., July 22nd.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld. :—Sec. Lt. A. L. Macfarlane, Spec. Res., July 26. Lt. C. S. Morice, Worc. R., July 27th.

Equipment Officers, 1st Cl.—From the 2nd Cl., and to be temp. Capts. whilst so empld. :—Temp. Lt. F. J. Baker, Gen. List; Lt. C. H. Morgan, Spec. Res.; Sec. Lt. (temp. Lt.) L. Bawn, Spec. Res. Temp. Lts., Gen. List :—J. H. B. Burgess, W. S. Hammond, W. E. Smith, July 1st. G. F. F. Collender, July 25th.

Gen. List.—Lt. W. E. B. Barclay, from R.N.V.R., to be temp. Capt., July 6th, seny. April 18th.

* * *

The King has been pleased to approve of the following Rewards for distinguished service in the Field, dated June 3rd.

Awarded a Bar to the D.S.O.

Maj. Arthur Justin Ross, D.S.O., R.E. and R.F.C.

Awarded the Military Cross.

Lt. Ernest Ayscoghe Floyer, Ind. Army R. of O. and R.F.C.
Lt. Thomas Henderson, R.E. and R.F.C.
Capt. Thomas Westropp Mulcahy-Morgan, R. Ir. Fus. and R.F.C.
Sec. Lt. William George Stafford, Gen. List and R.F.C.
Sec. Lt. (temp. Lt.) David Norrie Thomson, Yeo. and R.F.C.

War Office, August 9th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing. —Adjt.—Temp. Lt. R. H. Peto, Gen. List, and to be temp. Capt. (without the pay and allowances of that rank) whilst empld. as Adjt., May 15th.

War Office, August 10th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing. —Group Instr. in Gunnery.—Graded as a Flt. Comdr.—Sec. Lt. (temp. Capt.) A. P. Davidson, High. L.I., from an Instr. in Gunnery (graded as Equipment Officer, 1st Cl.), and to retain his temp. rank whilst so empld., vice Lt. (temp. Capt.) M. R. N. Jennings, Spec. Res., who reverts to Flying Officer (seny. May 20th, 1916), and relinquishes his temp. rank, July 28th.

Instr. in Gunnery.—Graded as an Equipment Officer, 1st Cl.—Lt. E. Parker, E. Lan. R., Spec. Res., from an Asst. Instr. in Gunnery (graded as an Equipment Officer, 3rd Cl.), and to be temp. Capt. whilst so empld., vice Sec. Lt. (temp. Capt.) R. C. Hardie, D. of Corn. L.I., Spec. Res., who reverts to Flying Officer (seny. Jan. 28th), and the rank of temp. Lt., July 27th.

Balloon Co. Comdrs.—Graded as Sqdn. Comdr.—Temp. Capt. H. D. Jensen, M.C., Gen. List, from a Balloon Co. Comdr. (graded as a Flt. Comdr.), and to be temp. Maj. whilst so empld., July 18th. Graded as a Flt. Comdr.—Lt. (temp. Maj.) E. B. Broughton, Spec. Res., reverts from a Balloon Co. Comdr. (graded as a Sqdn. Comdr.) at his own request to relinquish his temp. rank and to be temp. Capt. whilst so empld., July 23rd, seny. July 5th, 1916.

Special Appt.—Graded as an Equipment Officer, 1st Cl.—Temp. Lt. R. de Sarigny, Gen. List, from the 2nd Cl., and to be temp. Capt. whilst so empld., June 9th.

Equip. Officers, 1st Cl.—From the 2nd Cl., and to be temp. Capts. whilst so empld. :—Temp. Lt. A. W. Empson, Gen. List, June 9th. Temp. Lt. L. G. T. Sedgwick, Gen. List; Sec. Lt. (temp. Lt.) A. B. D. Lang, Spec. Res., July 6th.

War Office, August 11th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing. —Staff Officers, 2nd Cl.—Graded as a Brig.-Maj.—Lt. (temp. Capt.) W. A. A. Chauncy, York R., from an Adjt., R.F.C., June 22nd.

3rd Cl.—Graded as Staff Capts.—Temp. Capt. F. W. Prendergast, Leins. R.; Capt. R. D. Law, W. York R., T.F., and to be secd.; Temp. Capt. J. Hamilton, attd. E. Kent R., and to be transfd. to R.F.C., Gen. List, June 22nd.

Sqdn. Comdrs.—From Flt. Comdrs., and to be temp. Majs. whilst so empld.—Temp. Capt. F. J. Powell, M.C., Gen. List, May 16th. Lt. (temp. Capt.) C. M. B. Chapman, M.C., E. Kent R., July 20th.

Special Appts.—Graded as a Sqdn. Comdr.—Capt. (temp. Maj.) T. G. Hetherington, Hrs., from a Sqdn. Comdr., and to retain his temp. rank whilst so empld., June 22nd. Graded as Flt. Comdrs.—From Flt. Comdrs., July 15th :—Temp. Capt. W. E. G. Murray, Gen. List; Temp. Capt. S. S. Halse, Gen. List; Sec. Lt. (temp. Capt.) S. N. Cole, Spec. Res., and to retain his temp. rank whilst so empld.

Special Appts.—Graded as Park Comdrs., and to be temp. Majs. whilst so empld. :—Lt. (temp. Capt.) A. E. Snape, Spec. Res., from an Equipment Officer, 1st Cl.; Lt. A. E. Oxley, Spec. Res., from an Equipment Officer, 3rd Cl., June 22nd.

Equipment Officer, 1st Cl.—Lt. R. A. Courtney, Spec. Res., from the 2nd Cl., and to be temp. Capt. while so empld., June 22nd.

Special Appts. (graded as Equipment Officers, 1st Cl.). From Equipment Officers, 2nd Cl., and to be temp. Capts. while so empld. :—Lt. V. F. P. Bryce, Spec. Res.; Lt. P. P. Eckersley, Spec. Res., June 22nd.

* * *

The King has been pleased to approve of the award of the Victoria Cross to the following Officer :—

Capt. William Avery Bishop, D.S.O., M.C., Canadian Cavalry and R.F.C.

For most conspicuous bravery, determination, and skill.

Capt. Bishop, who had been sent out to work independently, flew first of all to an enemy aerodrome; finding no machine about, he flew on to another aerodrome about three miles south-east, which was at least 12 miles the other side of the line. Seven machines, some with their engines running, were on the ground. He attacked these from about 50 ft., and a mechanic, who was starting one of the engines, was seen to fall. One of the machines got off the ground, but at a height of 60 ft. Capt. Bishop fired 15 rounds into it at very close range, and it crashed to the ground.

A second machine got off the ground, into which he fired 30 rounds at 150 yards range, and it fell into a tree.

Two more machines then rose from the aerodrome. One of these he engaged at the height of 1,000 ft., emptying the rest of his drum of ammunition. This machine crashed 300 yards from the aerodrome, after which Capt. Bishop emptied a whole drum into the fourth hostile machine, and then flew back to his station.

Four hostile scouts were about 1,000 ft. above him for about a mile of his return journey, but they would not attack.

His machine was very badly shot about by machine-gun fire from the ground.

* * *

The King has been pleased to award the Distinguished Service Medal to the following man:—

Jnr. Res. Attdt. S. Rothwell, R.N.A.S.B.R., O.N. M15814 (Po.).

* * *

The following Officer is mentioned in Dispatches:—

Lt.-Comdr. (Act. Comdr.) R. Gregory, R.N.

* * *

The King has been pleased to approve of the award of the following honours, decorations and medals to Officers and Men for services in action with enemy submarines:—

DISTINGUISHED SERVICE CROSS.

Flt. Lt. Warren Rawson Mackenzie, R.N.A.S.

BAR TO THE DISTINGUISHED SERVICE CROSS.

Flt. Sub-Lt. R. F. L. Dickey, D.S.C., R.N.A.S.

DISTINGUISHED SERVICE MEDAL.

Air. Mech., 1st Gr., J. Watts, O.N. F4923.
Act. Air Mech., 1st Gr., E. E. Hughes, O.N., F7223.

* * *

The following Officer and Man have been mentioned in dispatches:—

Flt. Comdr. J. G Struthers, R.N.A.S.
Air Mech., 1st Gr., G. H. Ellis, O.N., F3423.

* * *

The King has been pleased to give orders for the appointment of the following Officers:—

DISTINGUISHED SERVICE ORDER.

Flt. Lt. Robert Alexander Little, D.S.C., R.N.A.S.

For gallantry in action and for exceptional skill and daring in aerial combats. Since May 9th, 1917, besides having driven off numerous artillery aeroplanes and damaged six hostile machines, he has destroyed six others. On June 26th, 1917, an Aviatik being seen from the aerodrome he went up to attack it. He engaged it and fired a burst at close range, and the enemy machine stalled and went down in flames.

Flt. Lt. Raymond Collishaw, D.S.C., R.N.A.S.

For conspicuous bravery and skill in successfully leading attacks against hostile aircraft. Since June 10th, 1917, Flt. Lt. Collishaw has himself brought down four machines completely out of control and driven down two others with their planes shot away. Whilst on an offensive patrol on the morning of June 15th, 1917, he forced down a hostile scout in a nose-dive. Later, on the same day, he drove down one hostile two-seater machine completely out of control, one hostile scout in a spin, and a third machine with two of its planes shot away. On June 24th, 1917, he engaged four enemy scouts, driving one down in a spin and another with two of its planes shot away; the latter machine was seen to crash.

BAR TO THE DISTINGUISHED SERVICE ORDER.

Sqdrn. Comdr. Charles Henry Butler, D.S.O., D.S.C., R.N.A.S.

For the skill and gallantry with which he attacked a formation of 15 hostile machines returning from a raid on England. Closing on one machine, he engaged it at close quarters. Presently he saw this machine nose-dive, crash into the sea, and sink. Meanwhile, he had engaged a second machine, but broke off the engagement to follow down the first machine. Afterwards he lost sight of the enemy formation and returned to his aerodrome.

* * *

The King has been pleased to approve of the award of the DISTINGUISHED SERVICE CROSS to the following Officers:—

Flt. Comdr. Alexander Macdonald Shook, R.N.A.S.

Flt. Lt. Arnold Jaques Chadwick, R.N.A.S. (since reported drowned).

Flt. Sub-Lt. Albert James Enstone, R.N.A.S.

Flt. Sub-Lt. Langley Frank Willard Smith, R.N.A.S. (since missing).

For exceptional gallantry and remarkable skill and courage whilst serving with the R.N.A.S. at Dunkirk during May and June, in repeatedly attacking and destroying hostile aircraft.

Flt. Lt. Cecil Hill Darley, R.N.A.S.

For conspicuous skill and gallantry on the night of July 2nd One of his engines having seized whilst he was over Bruges, he dropped his bombs on the objective and managed to fly his machine home on one engine and effected a safe landing on the aerodrome.

Flt. Sub-Lt. (now Flt. Lt.) John Edward Scott, R.N.A.S.

For the skill and gallantry with which he engaged a hostile machine returning from an air raid on England. Descending to 8,000 feet, he fired continuously until the enemy machine lost control, descended in a spinning nose-dive, and crashed into the sea.

Flt. Sub-Lt. Ellis Vair Reed, R.N.A.S. (since missing).

In recognition of his services on the following occasions:—On June 6th he attacked and drove down one of four hostile scouts. This machine dived nose first into the ground and was destroyed. On the afternoon of June 15th he was leading a patrol of three scouts and encountered a formation of 10 enemy machines. During the combat which ensued he forced one machine down completely out of control. Next he attacked at a range of about 30 yards another hostile scout. The pilot of this machine was killed, and it went down completely out of control. This officer has at all times shown the greatest bravery and determination.

Flt. Sub-Lt. Edward Robert Barker, R.N.A.S.

In recognition of his services on the occasion of an air raid on the Solway works at Zeebrugge on the night of July 15th-16th, when bombs were dropped on the objective with good results.

Flt. Sub-Lt. Rowan Heywood Daly, R.N.A.S.

For skill and gallantry in attacking enemy aircraft returning from a raid on England. After a long chase he engaged and brought down one machine in flames. Afterwards he engaged a second machine, but his gun jammed, and, though he continued the pursuit to the enemy coast, he failed to clear the jam, and was obliged to return to his aerodrome.

Flt. Lt. Reginal Rhys Soar, R.N.A.S.

For courage and skill as a scout pilot. On May 23rd, 1917, he attacked a two-seater artillery machine, and as the result of a well thought-out attack brought the machine down out of control. On June 12th, 1917, he brought down two enemy machines out of control. On June 29th, 1917, in company with Flt. Lt. Little, he attacked and brought down an Albatros scout. On July 3rd, 1917, whilst leading an offensive patrol, a formation of seven Albatros scouts was engaged, and he brought down one out of control. On July 13th, 1917, in company with Flt. Lt. Little, he attacked and drove down out of control one two-seater machine, following it down to within 1,000 feet of the ground.

BAR TO THE DISTINGUISHED SERVICE CROSS.

Flt. Comdr. Robert John Orton Compston, D.S.C., R.N.A.S.,

For gallantry in action and for very good work in driving away German artillery aeroplanes. On June 12th, 1917, with three other machines, he attacked six hostile scouts. He got close to one and shot it down out of control. On June 16th, 1917, he attacked and brought down a two-seater Aviatik. On July 3rd, 1917, he attacked two Aviatiks, which he drove down and forced to land.

Flt. Lt. John Edward Sharman, D.S.C., R.N.A.S.

For courage and skill in attacking enemy aircraft. On the evening of June 14th, 1917, while on an offensive patrol with three other scouts he observed five Albatros scouts. He dived on one of these, firing his machine gun at about 50 ft. range. The scout then went down in a spin. On June 24th, 1917, with six other machines, he attacked 15 Albatros scouts. After a combat at close range he destroyed one of these, its right plane and tail plane falling off.

* * *

The following awards have also been approved:—

DISTINGUISHED SERVICE MEDAL.

Ldg. A.C., T. Busby, O.N. F18555; A.C., 1st Gr., J. H. Daw, O.N., F12687; A.C., 2nd Gr., C. A. Millhouse, O.N., F22637; Air Mech., 2nd Gr., F. Anderson, O.N. F7389; Air Mech., 1st Gr., T. Caird, O.N., F6181; P.O. Mech. (E) H. Dixon, O.N., F4542.

* * *

The following Officers and Men have been mentioned in dispatches:—

Sqdn Comdr. R. H. Mulock, D.S.O., R.N.A.S.; Flt. Lt. W. R. Mackenzie, D.S.C., R.N.A.S.; Flt. Sub-Lt. R. F. L. Dickey, D.S.C., R.N.A.S.; Flt. Sub-Lt. F. R. Johnson, R.N.A.S.; Flt. Sub-Lt. A. H. Lofft, R.N.A.S.; A.C., 2nd Gr., J. W. George, O.N. F20006.

* * *

The following Decorations have been conferred by the Allied

Powers on Officers and Men of the British Naval Forces for distinguished services rendered during the war :—

CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

LEGION OF HONOUR.

COMMANDER.—Rear Adm. C. L. Vaughan-Lee, C.B.; Capt. G. M. Paine, C.B., M.V.O., R.N., Commodore, 1st Cl.

OFFICER.—Capt. A. V. Vyvyan, D.S.O., R.N.; Wing Capt. R. M. Groves, D.S.O., R.N.; Wing Comdr. I. T. Courtney, R.N.A.S. (Capt. and Temp. Lt.-Col., R.M.L.I.).

* * *

CONFERRED BY HIS MAJESTY THE KING OF ITALY.

ORDER OF ST. MAURICE AND ST. LAZARUS.

COMMANDER.—Rear Adm. C. L. Vaughan-Lee, C.B.

OFFICER.

Comdr. C. R. Dane, R.N. (Wing Comdr. R.N.A.S.).

CAVALIER.

Flt. Comdr. D. Harries, R.N.
Flt. Comdr. D. W. A. Barton, R.N.A.S.
Flt. Comdr. F. W. Lucas, R.N.A.S.

ORDER OF THE CROWN OF ITALY.

OFFICER.

Comdr. (Act. Capt.) H. Halahan, D.S.O., R.N.
Comdr. H. L. Woodcock, R.N. (Wing Comdr., R.N.A.S.).

CAVALIER.

Flt. Lt. R. F. E. Wickham, R.N.A.S.
Flt. Lt. R. F. Maitland, R.N.A.S.

The King has given unrestricted permission to the officers and men concerned to wear the Decorations in question.

WAR OFFICE, August 13th.

REGULAR FORCES.—STAFF ATTACHED TO HD.-QR. UNITS.—Brig.-Comdr.—Maj. (temp. Col.) R. E. T. Hogg, C.I.E., Ind. Cav., from a Group Comdr., R.F.C., and to be temp. Brig.-Gen. whilst so empld., June 22nd.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Staff Officers, 1st Cl. (Graded for purposes of pay as an A.A.G.).—Temp. Capt. F. R. Hedges, Gen. List, from the 2nd Cl., and to be temp. Lt.-Col. while so empld., June 22nd.

2nd Cl. (Graded for purposes of pay as a Brig.-Maj.).—Maj. A. R. Martin, T.F. Res., from Adjt., R.F.C., vice temp. Capt. (temp. Lt.-Col.) F. R. Hedges, Gen. List, June 22nd.

3rd Cl. (Graded for purposes of pay as a Staff Capt.).—Lt (temp. Capt.) M. Nicholson, R.F.A., T.F., from Adjt., R.F.C., June 22nd.

Flt. Comdr.—Sec. Lt. (temp. Lt.) T. E. Salt, R. War. R., T.F., from a Flying Officer, and to be temp. Capt. while so empld., July 31st.

Balloon Co. Comdr.—(Graded as a Flt. Comdr.).—Sec. Lt. (temp. Lt.) J. Mitchell, Spec. Res., from a Balloon Co. Comdr. (graded as a Balloon Officer), and to be temp. Capt. while so empld., July 28th.

ADJT.—Temp. Sec. Lt. (temp. Lt.) W. P. M. Newman, R.A., to be temp. Capt. (without the pay or allowances of that rank) while so empld., and to be transfd. to R.F.C., Gen. List, July 6th.

ROYAL REGT. OF ARTILLERY.—Sec. Lt. J. Young, T.F., relinquishes the acting rank of Capt. on ceasing to comd. an Anti-Aircraft Section, June 6th.

NAVAL.

The following appointments have been made in the Royal Naval Air Service :—

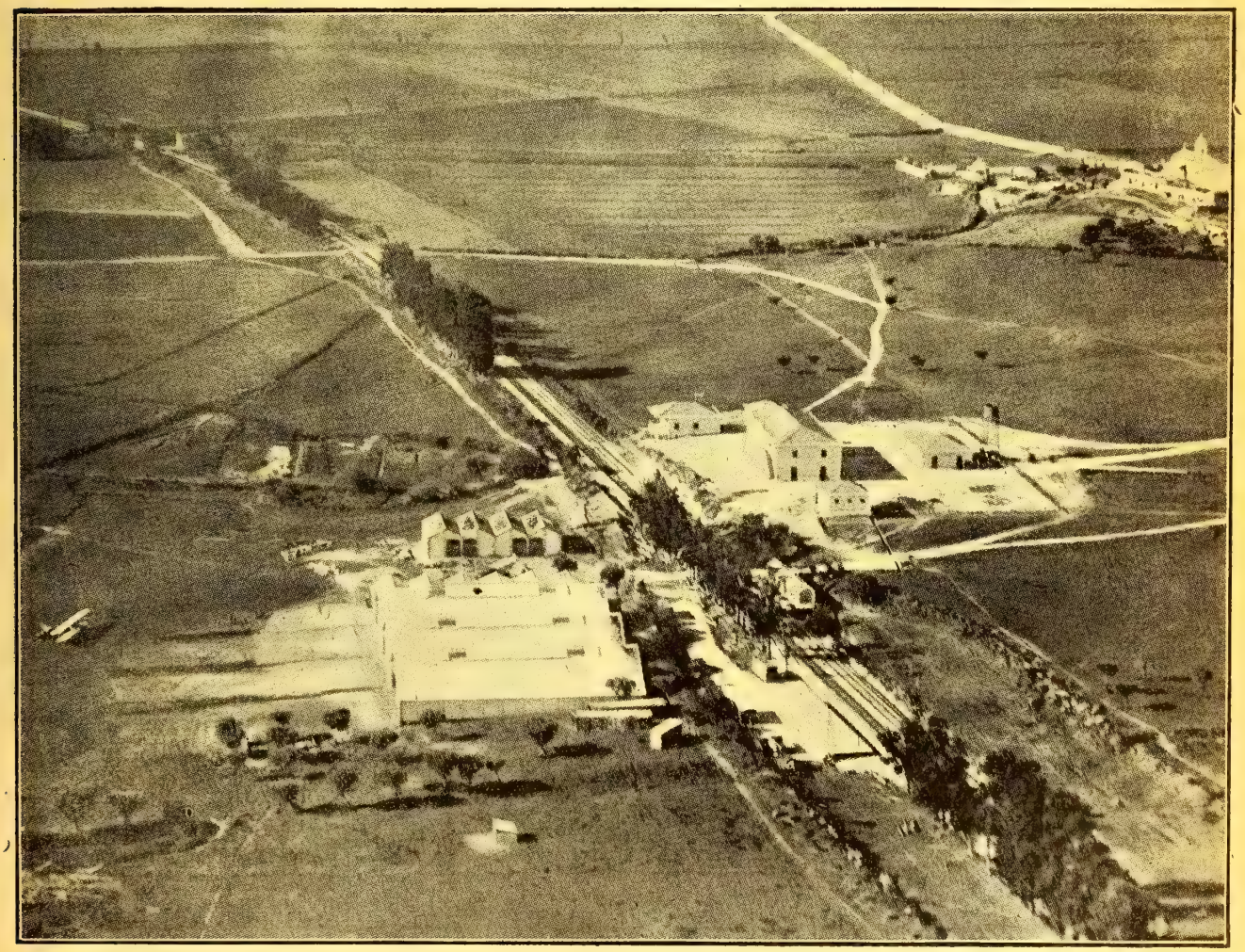
AUGUST 7th.—Lt.-Comdr. (Temp.).—E. Childers, D.S.C., to "President," July 27th.

Temp. commissions as Lt. (R.N.V.R.) have been granted to D. M. S. Watson, F. H. Illingworth, A. H. Dungay, and W. A. Powell, all seny. August 6th.

Temp. Flt. Sub-Lts.—J. A. Glen and H. F. Beamish specially promoted to temp. Flt. Lt. for meritorious war service, to date August 5th.

Temp. Flt. Sub-Lt. W. H. Mackenzie promoted to temp. Flt. Lt., with seny. June 30th.

AUGUST 8th.—Lt.-Comdr. R.N.V.R. (temp.).—R. A. Chalmers, graded as Act. Sqdn. Comdr. (temp.), seny. August 6th.



[Reproduced from the Official Bulletin of the Portuguese Aero Club.

FLYING IN PORTUGAL.—The Portuguese Army's Aviation School at Vila Nova da Rainha.

August 10th.—Mr. S. H. Page, granted a temp. commission as Lt. (R.N.V.R.), seny. August 8th.

August 11th.—Flt. Lt. (Temp.).—O. A. Butcher, granted rank of Act. Flt. Comdr., seny. August 10th.

W.O. (2nd grade).—H. A. Saunders, promoted to Lt. R.N.V.R. (temp.), seny. August 8th.

A.C. (2).—A. J. W. Giles, entered as Lt. R.N.V.R. (temp.), seny. August 6th.

Mr. J. C. Isaacs granted a temp. commission as Lt. (R.N.V.R.), seny. August 9th.

Admiralty Communiqués.

August 11th.—Several tons of bombs were dropped by the Royal Naval Air Service during the night of August 9th-10th on the following military objectives:—

Ghistelles Aerodrome.

Zuidwege railway sidings.

Thourout railway junction.

Dense clouds of smoke were caused at Zuidwege. The railway junction at Thourout was also attacked by gunfire from the air.

Yesterday afternoon (August 10th) a further bombing raid was carried out on the aerodrome at Sparappelhoek.

All machines returned safely.

August 13th.—One hostile aeroplane, Gotha type, was destroyed during the return of the raiders to the Belgian coast, and one hostile seaplane was destroyed off the coast of Flanders at approximately the same time.

A large number of R.N.A.S. machines engaged the other raiders oversea, without decisive result.

The pilot who destroyed the Gotha, and who was flying a land machine, reports that he first pursued an enemy aeroplane flying at 12,000 ft. from the North Foreland to about 15 miles off Zeebrugge, where he lost the hostile aircraft. Returning to the mouth of the Thames he observed anti-aircraft fire bursting in the vicinity of Southend and flew in that direction climbing.

He then observed eight Gotha aeroplanes followed by four British machines steering north-east. The enemy machines were about 2,000 ft. above him when he got beneath them; he pursued, climbing to 18,000 ft., and attacked without result when about 30 miles out to seaward.

At this moment he saw a single hostile machine 4,000 ft. below the enemy formation, but flying with it. He attacked from the front and drove the enemy down to the water, where he observed him turn over, and saw one of the occupants hanging on to the tail. Thereupon, he threw him his lifebelt, and did two or three circuits around him before returning to England. While returning he endeavoured to communicate the position of the hostile machine to British destroyers.

The Casualty List.

Reported August 10th.

Previously reported Missing, now reported Killed.—Richardson, Flt. Lt. (Act. Lt., R.N.R.) W. H., R.N.

Mr. James R. Barry, Midshipman, R.N.R.

Previously reported Missing (Believed Killed), now presumed Drowned.—Chadwick, Act. Flt. Comdr. A. J., D.S.C., R.N.

Previously reported Missing, now presumed Killed.—Peberdy, Flt. Lt. W. H., R.N.

Reported August 11th.

Accidentally Killed.—Dunning, Sqdn. Comdr. E. H., D.S.C., R.N.

Slightly Injured.—Leather, Flt. Comdr. G. V., R.N.

Mayes, Prob. Flt. Officer H. R., R.N.

Reported August 13th.

Killed.—Casey, Act. Flt.-Comdr. F. D., D.S.C., R.N.

Missing (Believed Killed).—Woodhouse, Flt. Sub-Lt. M. G., R.N.

Missing.—Munro, Flt. Sub-Lt. K. R., R.N.

Bridge, Flt. Sub-Lt. B. H., R.N.

PERSONAL NOTICES.

Deaths.

DUNNING.—Sir Edward Dunning, of Jacques Hall, Bradfield, Essex, has been informed of the death of his son, Sqdn.-Comdr. Edwin Harris Dunning, R.N., while flying. Sqdn.-Comdr. Dunning was 25 years old, and was wounded on June 20th last year while fighting an enemy airship in the Ægean, for which he received the D.S.O.

He was born in 1892, and was educated at Fonthill, and at the Royal Naval Colleges at Osborne and Dartmouth. On the outbreak of war he joined the R.N.A.S. He was wounded on June 20th, 1916, in an air fight over the Ægean, and received the Distinguished Service Cross for his gallantry on that and other occasions. He was flying as a pilot with Lt. Oxley, C.B., D.S.C., as observer, on escort and reconnaissance patrol for a flight of bombing machines. Two enemy machines were engaged at close range and forced to retire, and as his machine withdrew Sqdn. Comdr. Dunning was hit in the left leg and the machine was badly damaged. His observer improvised a tourniquet and took control of the machine while Sqdn. Comdr. Dunning adjusted the tourniquet. The pilot was obliged to keep his thumb over a hole in the petrol tank in order to preserve sufficient fuel to reach the aerodrome, where he made a good landing.

The funeral took place on August 11th at Bradfield parish churchyard. Sqdn. Comdr. Dunning was killed while flying in the North.

Engagements.

KEANE—MONTGOMERIE.—A marriage has been arranged, and will take place (leave permitting) at Christ Church, Down Street, Mayfair, on the 21st inst., at half-past two o'clock, between Flt. Sub-Lt. E. J. Keane, R.N., and Evelyn Mary Montgomerie (late Q.A.I.M.N.S.R.), eldest daughter of James C. Montgomerie, 9, Walpole Gardens, Strawberry Hill, Middlesex. There will be no reception, but friends will be very welcome at the church.

SHOPPEE—TAIT.—The marriage of Flt. Lt. L. Conrad Shoppee, D.S.C., R.N., and Hilda Gifford Tait, will take place at East Cowton Parish Church, Northallerton, Yorks, on September 5th, at 2.30 p.m. The ceremony will be performed by the Lord Bishop of Knaresborough, assisted by the Rev. R. Gifford Wood, uncle of the bride.

Marriages.

BROWNE—CAPPON.—On the 7th inst., at St. Mary's Church, Caterham, Flt. Lt. Chetwode W. C. Browne, R.N., only son of Willis Browne, Esq., of "The Beeches," Caterham, was married to Dorothy Janet, younger daughter of the late James Cappon, of Fifeshire, N.B., and Mrs. Howard Goodman, of Banavie, Caterham, by the Rev. G. A. Leslie Colvill, of Madron Vicarage, Heamoor, S.O., Cornwall, assisted by the Rev. Prebendary Heard.

LOUTH—EVERITT.—On August 4th, at Reading, Prob. Flt. Officer Trevor Louth, R.N.A.S., was married to Dora May, daughter of Mr. H. A. Everitt, of Reading.

MILITARY.

G.H.Q. Communiqués.

August 8th, 9.5 p.m.—Yesterday, in spite of continuous mist and clouds, our aeroplanes bombed the enemy's railway tracks, sidings, and trains 40 miles behind the German lines, causing much damage, and, in particular, derailing one train and blowing up another. Bombs were also dropped during the previous night on an enemy ammunition depot.

One of our machines is missing.

August 9th, 9.6 p.m.—Work in the air was continued yesterday, although bad weather again interfered greatly with flying.

In air fighting, two German aeroplanes were brought down, and one other was driven down out of control.

None of our machines are missing.

August 10th, 9.56 p.m.—There was great activity in the air yesterday on both sides, but a strong westerly wind and thick clouds made it difficult for our aeroplanes to engage the enemy's machines. Bombing and artillery work were carried out successfully during the day.

In air fighting, five German aeroplanes were brought down and five others were driven down out of control. In addition, two German observation balloons were brought down in flames and four others were driven down badly damaged.

Four of our aeroplanes are missing.

August 11th, 9.27 p.m.—Yesterday, for the first time for over 10 days, a full day's flying was possible. Enemy aircraft showed great activity, crossing our lines in many places, attempting to prevent our artillery work, and attacking our bombing machines. In spite of their efforts, a great deal of successful artillery observation work was carried out by us.

A large number of photographs were taken, many targets on the ground were effectively engaged with machine-gun fire, and, in the course of the day and night, six and a half tons of bombs were dropped on the enemy's aerodromes, ammunition depots, and other points of military importance.

Fighting was very severe all day, the enemy being encountered in large formations. 10 German machines were brought down by our aeroplanes and 5 others were driven down out of control. Another enemy machine was driven down out of control by gunfire.

Twelve of our machines are missing.

August 12th, 8.58 p.m.—In spite of repeated storms and strong westerly winds, which greatly favoured the enemy, our aeroplanes carried out much successful work again yesterday.

In air fighting 3 German machines were brought down and 4 others driven down out of control.

Two of our aeroplanes were forced to land behind the enemy's lines, and 3 other British machines are missing.

August 13th, 8.40 p.m.—Our aeroplanes and balloons carried out a great deal of successful work yesterday in conjunction with

(*Continued on page 471.*)

AERONAUTICAL ENGINEERING

SUPPLEMENT TO "THE AEROPLANE"

INCORPORATING AIRCRAFT ENGINEERING, AERODYNAMICS, AND MATTERS PERTAINING TO THE AERONAUTICAL ENGINEER AND THE AIRCRAFT TRADER

The Production of Aeroplanes and their Components

(Ninth Instalment.)

BY STEPNEY BLAKENEY.

Wiring Plates.

The metal, together with the job and instruction card, and the blue print having been received, the foreman will then give the blue print to the setter-out, together with the instruction card.

The setter-out will then take a piece of thin metal, and set out the wiring plate. This will, on completion, be sent to the inspection department to have the setting-out checked with the drawing. It can then, if passed, be sent to the template maker, who will produce one setting-out template.

When this is done the template will be sent to the inspection department. If correct, it can then be sent for the final inspection to the A.I.D.

When this is passed, the marker-off will mark out on the sheet steel to be used a number of the parts as specified on the job and instruction card. This sheet of steel will then be handed to the operator on the metal jig-saw, who should at once proceed to saw out the parts set out on the sheet of steel, as closely to the outside of the scriber lines as is possible, but taking care at all times to leave the line visible.

Manual Work.

As soon as some of these parts are roughly cut out, certain of the bench hands should at once be detailed to commence finishing these off, and as the remainder of the batch come from the metal jig-saw, they also should, if possible, be distributed amongst further workers.

By this means a large number of components can be quickly put through the works, and passed to the inspection department, who, if they find them correct, will pass them into the finished part stores. In this manner all parts required by the erectors can be made; and, if the progress department see that the right proportion of parts of various kinds required are made each day, there should be perfect progress. If there is not, the progress department should adjust and alter the numbers of parts demanded from the metal department, or the number of hands employed on any special kind should either be increased or decreased.

Drilling Plates.

The wiring plates having been filed up to shape and finished, the next thing will be the drilling of the holes at each end to take the A.G.S. pins of the fork ends, which are screwed on to the tie rods.

The necessity for these being perfectly drilled in their correct position, and absolutely at right angles through the wiring plates, renders it necessary to construct a drilling jig, in which one or two wiring plates may be drilled at one time, according to the design of the jig.

A Drilling Jig.

An easy way of making a jig is first of all for the expert setter-out to mark off the holes on a perfect wiring plate with the greatest possible care. He should use a sharply pointed fine centre-punch, and "centre pop" the centres of all holes required with absolute accuracy, especially taking care to hold the centre-punch vertically over the position of the hole which it is intended to drill, as if this is not done it will be found that the holes when drilled are not accurate, and just a couple of hundredths out of their correct theoretical position. Therefore give this simple matter the attention it richly deserves, as if this is not done it gives the small twist drill a lead off in the wrong direction.

Having done this, take a pair of fine spring dividers and set out the outside diameter of the hole, just a shade larger than the true size, so that when commencing to drill the hole, before allowing the drill to cut its full diameter cut, it will be possible on examination to satisfy yourself that the hole when drilled, will be truly concentric with the small circle made by the spring dividers. If it is not concentric, alter it, or, as it is known in drillers' language, "draw the hole," to its correct position. This is done by means of a small, accurately ground, diamond-pointed chisel, cutting a small chip out of the side to which it is intended, or necessary, to draw the hole.

Preparing the Jig.

Assuming that we have drilled the wiring plate with a 3/32-in. drill in all holes, irrespective of their final required size, this operation only being done for the purpose of assisting us to produce an accurate drilling jig, take the wiring plate and lay it on a piece of ⅜-in. or ½-in. thick steel plate, say in this case about 6 in. by 3½ in., previously carefully levelled by shaping up each face parallel to the other, and locate the wiring plate in the centre as near as possible. This plate will ultimately become the jig. Clamp it there, and accurately mark the holes off the wiring plate onto the jig-plate.

Having done this, unclamp the wiring plate, and with the spring dividers set out a ⅛ in. circle round each centre pop so that when you commence drilling you can see that the drilling is going to be accurate.

The 3/32 in. holes having been drilled in the ⅜ in. steel plate, take the wiring plate and lay it again on the steel plate, and either rivet it in position, with a rivet at each end, and if possible one in the middle, or bolt it on. This being done, the jig-maker can fit a semi-circular piece of steel, ¼ in. thick, round each end of the wiring plate lugs, to keep it in position, leaving each piece big enough to be drilled and riveted in position.

SKETCH OF DRILLING JIG.

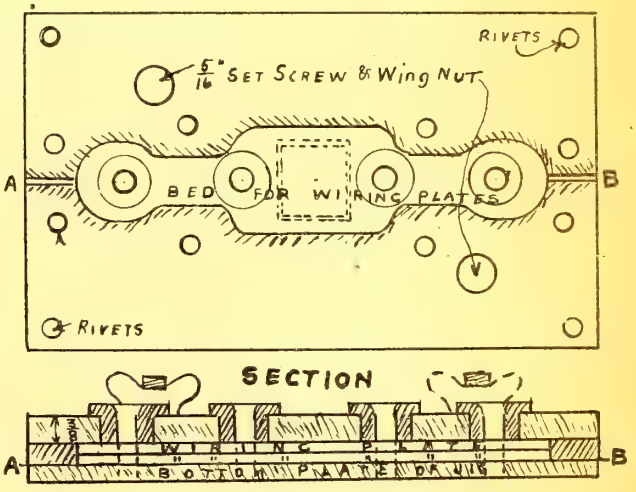


FIG 15

These pieces having been fitted, the next thing to do is to fit a ¼ in. piece, or strip, of steel to each side of the wiring plate, and when accurately fitted, rivet them to the ⅜ in. steel plate. The four pieces thus fitted form a bed for the wiring plates to be dropped into, say, two of them, or any other number according to the gauge of the steel.

This work having been completed, remove the temporary rivets from the wiring plate, and enlarge the holes previously occupied by the 3/32 in. rivets, in the steel plate and the other holes, to a size equal to about 3/16 in. bigger in diameter than the required size specified on the drawing.

This is done to enable the hardened steel drill guides, or bushes, to be fitted into the holes drilled in the ⅜ in. steel plate. These are necessary because an ordinary hole is liable to wear out of shape and cause inaccurate drillings, and, as these bushes are removable, they can always be replaced with new ones when worn.

Making Drill Bushes.

The hardened steel bushes should be made to the following dimensions. Assuming the diameter of the hole in each end of the wiring plate lugs is 3/16 in., it follows that a 3/16 in. twist drill will be used. Therefore the hole in the hardened steel bush will be drilled 3/16 in. The depth of the bush should be about equal to five diameters of the drill, which equals in this case 15/16 in. The walls of the bush may be, say, ⅛ in. thick each side plus the 3/16 in. hole.

The total diameter of the bush will, therefore, equal 7/16 in., the length being equal to the thickness of the jig plate, namely, ⅜ in., and finishing up with a square shoulder, say, of ⅛ in. wide, making the total diameter of the bush about 11/16 in. with the entrance to the 3/16 in. hole nicely rounded.

These bushes will be a pressing fit into the holes in the ⅜ in. plate.

Having fitted similar bushes to all holes in the jig plate, the next thing will be to make a cover plate over the bottom of the jig to keep in the wiring plates tightly whilst they are being drilled. For this purpose we can use a piece of plate about ¼ in. thick, fitted with two hinged bolts and wing nuts, which fit into slots in the upper plate. This allows the wiring plates to be drilled in this jig being tightly clamped up to the underside of the drilling jig plate accurately in position. Having fitted this plate the jig can be tested, and if found correct, can be put into general use in the machine shop. (See Fig. 15.)

These jigs, although involving some trouble to make, very quickly pay for themselves, as the drilling is accurate, and thus no wiring plates will be scrapped, which is the principal point in our days, when time and material are scarce and rapid production is essential.

Strut Sockets.

Having completed the drilling of the wiring plates and bent the lugs, the next thing to make is the small square steel shoe which has to be attached to the wiring plate by either brazing or welding. This shoe is necessary as a stay or bed for the strut end.

The way this may be made is to take a strip of steel equal in length to the total of the four sides plus an eighth for bends, and bend it round a steel mandril of the correct size, and weld the joint together. After this, the ends may be trued up until the shoe is ½ in. deep. It can then be clamped on to the wiring plate in its correct position, and welded in the welding shop by the oxy-acetylene welding process. It should be noted by all that the welding must be neat and thorough, as no filing of welded work is permissible under any circumstances; and considerable care must be taken by the operator not to overheat or burn the fitting.

(To be continued.)

STRUT TAPERING.

The following letter has been received apropos Mr. Blakeney's remarks on strut tapering :—

Sir,—In reply to Mr. Blakeney's query re tapering of struts on the overhand, I shall be delighted if I can do anything which tends to increase our output of machines at the present moment. Some machinists will know the method, but presumably there will be some who won't.

The front bed of the overhand is always kept level with the track of the knives (except when altered for a special job). Now suppose a strut 3 ft. long, 3 in. by 1¼ in., which we want to taper to 2 in. by 1¼ in. at the ends, leaving 3 in. full section at the centre. See sketch (Fig. A) :—

First of all set the back bed ½ in. below the track of the knives, then clamp thereon a piece of wood 16½ in. from the joint of the front bed. (Note.—Those sizes will require a little adjustment in practice.)

Put the end of the strut against this piece, then gradually bring the strut down onto the front bed, and push it along, taking care to keep the rear end of the strut down on the bed. A glance at the sketch (Fig. B) will, perhaps, make it clearer. Of course, the operator has to keep a firm grip of the job!

It will be found that the wood has been gradually taken off from nothing to ½ in. I have the ends of the main spars tapered after the same principle, but do not use the piece of wood clamped onto the back bed. The spars are marked and simply laid onto the line.

If a camber be required on the struts instead of a straight taper it would be best to cut at the bandsaw and clean off on the spindle, using the ring and a template.

Working straight against the spindle no adjustment of the cutter is possible unless you cut only one side, which is very bad practice.—D. D. Haldane.

Mr. Blakeney replies :—

Sir,—In reply to Mr. Haldane's letter, the information contained therein is exceedingly useful, and in the interests of those whose experience of woodwork is not as extended as they might consider desirable, it certainly serves a most useful purpose to find space for his letter.

I have made some sketches, which will, I trust, convey to those interested in the subject the methods used and referred to by Mr. Haldane.

I think if Mr. Haldane studies all the various types of spindles in use that he will find many in which it is possible to work against the spindle, using two cutters and adjust same. This is done by using loose collars on the spindle and gripping the cutters in parallel slots in between.—S. B.

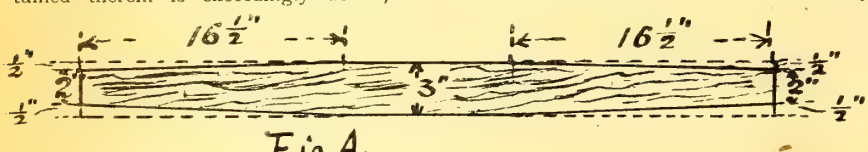


Fig. A.

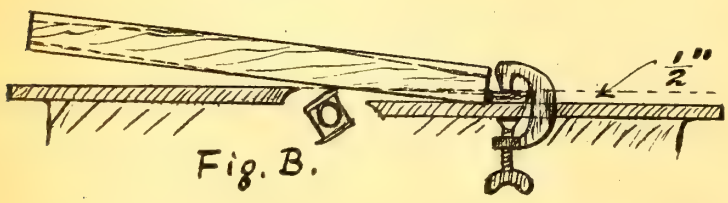


Fig. B.

AMERICAN TRADE NOTES.

It is intended that a permanent exhibit of aircraft materials, including engine parts and sections of planes, will shortly be opened at Washington, D.C., by the National Advisory Committee for Aeronautics and the Aircraft Production Board. This exhibit is intended principally for the education of manufacturers whose previous experience would lead them to aircraft work.

The example might be followed with advantage by the British Services.

* * *

According to the American newspaper, "Aviation," of July 1st, the Aircraft Production Board has officially announced that a group of nearly 125 "experts" sent from America to study the manners and customs of the British Aircraft Industry has safely arrived in England. It occurs to one that the depletion of the small stock of aviation "experts" available in the United States by the number of 125 will result in a considerable increase in the output of the American industry!

Doubtless, the British Industry would be glad to get rid of some of the official experts in a similar way.

* * *

It is reported by the American Press that there are now "100 Curtiss J.N.4 type machine in use on the French front in reconnaissance and artillery spotting work." It seems more probable, however, that the machines are being used for training purposes.

* * *

The International Committee to standardise the metal parts of aircraft held its first meeting at New York on August 8th. Representatives of the United States, Great Britain, France, Italy, and Canada were present. The work is expected to reduce the thousands of metal parts now in innumerable sizes to a few standard shapes, thus facilitating aircraft production on an enormous scale for the Allies.

Glue for Use on Aeroplanes.*

By PERCY A. HOUSEMAN.

[From "Aviation," New York, July 1st, 1917.—Hence the use of the word "airplane."]

There are many parts of an airplane that require the use of an adhesive material. Of these may be mentioned "airscrews" (the collective name for propellers and tractors), hollow spars, booms, ribs, plywood, etc. For some of the small parts, such as the ribs, which are subsequently covered by "doped" fabric, it is not necessary to use the best quality of glue. For other parts, however, it is of vital importance that only the strongest glue be used. This applies particularly to airscrews, which rotate at a very high speed.

Airscrews are built up in laminæ of walnut or mahogany, usually 7 in number, and each 1 in. thick. It is usual to glue two laminæ together, and allow them to remain in clamps for a period of from 6 to 24 hrs. before gluing on the next lamina. The finished airscrew is shaped out after the total number of layers have been glued together and have been allowed to set. The glue is applied hot, and usually by at least two workmen, in order to cover the surface as quickly as possible. The temperature of the gluing room is kept above 70 deg. Fahr. It would, of course, be an economy to glue at one operation all of the laminæ of an airscrew, but this is not possible when a cake glue is used, on account of the rapidity with which the hot solution sets. Attempts have been made to overcome this difficulty by the use of "liquid" glues, but these have usually proved unsatisfactory. One French liquid glue contained some hygroscopic material, and failed to set in 14 days. "Liquid" glues should be used only on work in which great strength under widely varying conditions of temperature and humidity is not of prime importance. Bone glue should never be used on aircraft work. The best results are obtained from skin or hide glues.

In working out a method for the examination of glue some attention was given to such chemical and physical tests as moisture, ash, nitrogen, strength of jelly, viscosity, percentage precipitable by alcohol (Stelling's test), etc., but while the information furnished by these tests was of interest, it was not found possible to correlate definitely the results obtained, with the value of the glue for airplane work.

A method was, therefore, developed to test the strength of a glued joint under various conditions. Experiments were made with blocks of biscuit-ware, as recommended by Rideal in his book on "Glue and Glue Testing." Messrs. Doulton, of London, kindly made the necessary blocks, which had a base (*ab*) 1 in. square, similar in design to that shown in Fig. I.

Two such blocks were glued together under various conditions of strength of glue solution, temperature, method of application, pressure of clamping, etc. The blocks were pulled apart in a cement-testing machine with automatic application of the load, but as uniform results could not be obtained, the stone blocks were abandoned. More uniform results were obtained with wood, which also has the advantage of giving results more nearly comparable with those obtained under actual Service conditions. Pieces of carefully selected straight-grained walnut were used, and from them a number of different types of joints were prepared, and used to illustrate different kinds of stresses. The type of joint finally adopted is that shown in Fig. II. This joint gives by no means a true shear, as was easily seen by examining under polarised light a celluloid model made to scale. A stress more nearly approaching pure shear would probably be obtained with a joint like that shown in Fig. III, made up from pieces 9 in. by 2 in. by ¼ in. but for the purpose of obtaining comparative results, that shown in Fig. II answers well, and has the advantage of simplicity.

The wood is exposed for 24 hours to a temperature of 35 deg. Cent. before making the joint. The test pieces (*A*) are 9 in. by 2 in. by ⅜ in. These were roughened by a toothed plane, as it was found that a roughened surface gives a stronger joint than a smooth one. The distance pieces (*B*) are 3 in. by 2 in. by ⅜ in. The area of the glued surface of the joint to be pulled apart is 4 sq. in. To prepare the glue, it is broken into small pieces, and is soaked over night in the requisite amount of water. For the gelatine types of glue, 1 part by weight of glue to 2 parts by weight of water gives a desirable concentration, while for "Scotch" glues 1 part of glue to 1.25 parts of water gives the best results. For other types of glue the water required usually falls within these limits. The soaked glue is dissolved by warming to 60 deg. Cent., and the solution is applied at that temperature. The joints are clamped under moderate pressure for 48 hours, and are tested after a further 24 hours. For each sample of glue, the following three tests, each in duplicate, are carried out on the joints prepared as described above.

BLOCKS AND JOINTS FOR GLUE TESTING

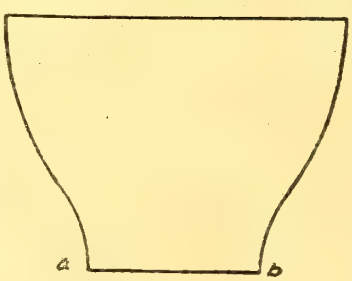


FIG. I

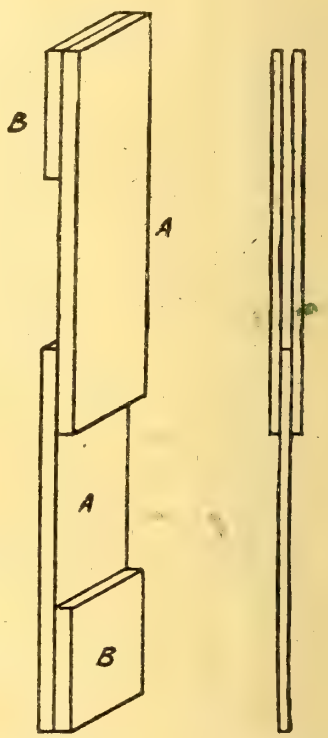


FIG. II

FIG. III

Regular Test.

The joints are pulled apart in a Buckton and Wicksteed or in a Riehlé (Philadelphia) Testing Machine and the breaking strain per sq. in. of glued surface is recorded. The experimental variation is less than ± 10 per cent., most of which may be ascribed to unavoidable variations in the wood.

Heat Test.

The joints are subjected to dry heat in an electrically heated oven for 2 days at 45 deg. Cent., and then pulled apart, and the breaking strain recorded.

Immersion Test.

The joints are completely immersed in water at 20 deg. Cent. for 12 hours, and are then pulled apart, and the breaking strain recorded.

The last two tests are intended to throw light on the behaviour of an airscrew under the extreme conditions of a tropical climate and high humidity. Tests were also made with moist heat, and on immersion followed by dry heat, but were discontinued. The last-named test was found to be too drastic, all glues giving very low results.

The whole procedure outlined above is an arbitrary one, and for this reason it is necessary rigidly to standardise and adhere to the technique of the method, in order to obtain comparable results. When the break occurs in the wood, as frequently happens in the regular test, one can, of course, only say that the glue is stronger than the wood, and record the figure at which the wood breaks.

Addition of phenol to the glue improves the regular test. The influence on heat tests and on immersion tests is not marked, but the tendency is to raise them slightly. The addition of 5 per cent. phenol to a 1 : 2 gelatine solution, depressed the setting point of that solution from about 26 to 18 deg. Cent., while 10 per cent. phenol caused the solution to be still viscous at 5 deg. Cent. The addition of 5 per cent. phenol to glue solutions to be used on airplane work is, therefore, to be recommended, both

*From the "Journal of Industrial and Engineering Chemistry."

because of its tendency to increase the strength of the joint, and also on account of its action in depressing the setting point.

Ammonia causes the glue to set more rapidly. It was found to have the unexpected effect of raising the figures for heat and immersion tests, while leaving regular tests little affected.

The Germans appear to have used a casein glue on some of their aircraft. An analysis of a Swiss glue of this type showed its composition to be about 66 per cent. casein and 23 per cent. mineral matter. The latter was composed of soda, silica, lime and alumina. About 1 per cent. of petroleum was present in the powder. This casein glue is prepared for use by rubbing up with cold water. It requires about 3 days for the joint to set, but has the advantage that all the laminæ of an airscrew can be glued together at once.

The following test figures were obtained on joints made with the Swiss casein glue:

Regular.		Dry Heat.		Moist Heat.		Immersion.	
551	655	526	661	448	465	672	862

The immersion test is particularly high.

Casein glues are very generally used for cementing together the "veneers" on ply-wood which finds extended use in the body and other parts of the airplane. One English firm uses a mixture of casein, lime, and blood, which yields a cement very resistant to water. A three-ply board made with such a cement will withstand an immersion test in water at 50 deg. Cent. for 12 hours without any separation of the plies, though the strength of this cement on a "regular" test is inferior to that of a hide glue.

Another firm of ply-wood manufacturers uses lime and casein only, in the proportion approximately of 4 parts by weight of lime to 7 parts by weight of casein. Casein and borax form a good mixture, but are, of course, more expensive than casein and lime. Casein glues cannot be kept more than a few hours after mixing with water, so that a batch when mixed must be completely used, or the residue wasted.

When a new glue is intended for use on airscrews, the tests described above should be supplemented by a practical test of spinning a trial airscrew with the new glue.

Table I—Influence of Addition of Phenol or Concentrated Ammonia to Glue on Strength of Glued Joint.

Glue Tests	Regular.		Heat.		Immersion.	
Gelatin A	644	627	459	...	504	...
Gelatin A + 5% Phenol	532*	616	476*	627	621	...
Gelatin A + 10% Phenol	677*	845	369	487	560	660
"Propeller" Glue	464	...	470	464	540	504
"Propeller" Glue + 5% Phenol	526	593	395*	506	553	560
"Propeller" Glue + 10% Phenol	610	632	315	429	560	565
"Scotch" Glue	548	571	448	470	448	470
"Scotch" Glue + 5% Phenol	688*	723	425	425	532	548
"Scotch" Glue + 10% Phenol	694	694	414	453	436	476
Gelatin A	627	644	459	565	504	549
Gelatin A + 2% Ammonia	610	655	616	688	800	875
"Propeller" Glue	464	...	464	470	540	504
"Propeller" Glue + 2% Ammonia	520	532	580	669	648	783

The figures represent breaking strain in lbs. per sq. in. of glued surface of the standardised joint. Breaks in the wood are indicated thus*.

THE CASE OF AUTOGENOUS WELDING.

II.

And truly autogenous welding for one, though beneath practical consideration at its worst, at its best may go very far indeed. Even for the straight away creation, from tube, sheet or channelling, it is no exaggeration to say that it begins where press and anvil, core and print, lathe and milling-tool, retire incompetent. While as for repairs, it literally spells salvation for the Gehenna of the junk merchant; from the greasy depths of which it can snatch its crowning triumph, in the mended gear, not only true-pitched and tempered as ever, but actually strengthened. If savings make rich its increment is as sovereigns to shillings. Logically considered, it should abolish the scrapheap. On the other hand, used for pure destruction and removal of the remains to provide new raw material, blow-pipe, and oxygen-tube between them could even effect economy in an Admiralty dockyard.

Now, to come to some of its practical detailed points after this general disquisition of the merits of autogenous welding, the main thing to consider is its treachery, and the need for all sorts of counter-dexterities. There are more or less accepted rules—albeit liable to be falsified out of hand by a change from one metal to another—which prescribe a definite-sized jet—that is, one in which the pressure and flame are regulated by the bore of the supply nozzle—for different thicknesses of metal. For this reason alone, there is one British made blow-pipe with a trigger controlled revolving multiple jet.

Yet, given a correct start to this extent, the immediate demons are carbonisation—the result of an over-mixture of acetylene—which fouls the work out of hand, masks the flux, and generally results in adhesions—and oxidising, the result of too much oxygen, which chemically degrades the mechanical value of the metal. Here, again, the above-mentioned blow-pipe scores, for upon a constant pressure of acetylene, the oxygen supply can be regulated to perfection by a needle-valve with a milled thumb-nut. "Can be" is the phrase; for the trouble is to persuade the average *chalumier* to use it, and not to attempt regulation from the tube or gas container.

Having then, got so far as the perfectly adjusted flame in even volumes, from one-third to half an inch long—again according to the job in hand—what comes next? The choice of the right flux, of which there be many. There is one—the trade secret of the greatest wizard in metals I ever knew—of which the material will never run short so long as there are broken bottles, granite and—horses. The thing is to make it up. There are others, compounded of sal-ammoniac, silicon—for cast-iron—phosphorus—for copper or bronze—aluminum for brass; lithium potassium—pure and in the fluoride or bisulphate; borax, sodium borate; boracic acid; and many other substances; for which compounds the various "best" formulæ are generally known, but which may well be varied—as experience brings the practitioner into the higher flights.

Now, the real purpose of a flux is, of course, to keep the actual metal under the flame clean and free from degrading chemical combination in the first place. But, secondly—one might almost say simultaneously—it is intended to assist fusion. And, thirdly, in many cases, it is required to assist useful chemical combination so as to amplify thereby the metallic quality of the weld.

Here, then, clearly, is meat for experience, and for a hundred-and-one special considerations. For they all lead up to comprehension of the purpose of the third essential to good welding, the good because appropriate filling rod. And that purpose, briefly, is to give the metal of the weld, so far as you may, a little better quality than that of the surrounding metal.

For instance, in making a weld of sheet or "wrought" iron, or mild steels, one should use a rod of the very finest Swedish—or, better, South American—close-grained iron that can be had for money. And the very section of such a rod—any filler, in fact—is of the first importance, as the best is obviously the one that offers the least surface for oxidation during the melt. Or, again, for a copper weld, the rod (though otherwise of the purest grade of copper in its basic composition) should contain a little phosphorus—just enough to free the metal without letting it run at too low a heat, but not enough to take the natural stretch out of it or the subsequent weld—and just a trace of aluminum.

Then, again, there is the question of preparation. Pieces for repair—especially iron castings—need special stoving, just as much as a surgical patient needs an anæsthetic for a successful operation: and, equally, require a similar treatment for gradual cooling, much as the patient needs nursing back to consciousness. While still warm, too, the "nature" of the weld is greatly assisted to homogeneity with the rest by judicious light and constant hammering. In fact, a specially designed light pneumatic hammer would be an ideal tool for any shop in which much welding of mild steels is done. Yet one has to know exactly when to leave off hammering; which is, the moment that the steel begins to attract a magnet.

Further than these preparatory considerations, one comes at last to the execution of the job itself. The repair—or, indeed, any autogenous weld—must be regarded as a deep cut or wound that has got to heal by "first intention"—that is, from the bottom upwards to the surface. Therefore let the trench be fairly wide by filing a good bevel on the contiguous edges. Too narrow a trench means that the weld will either not, "go through," or if it does seem to do that, it may imprison oxidised particles—a whole stratum of them midway. So the job may look and finish well, yet really be internally rotten.

Too wide a trench, on the other hand, will probably lead to "adhesions," which means that although the melted metal seems to run in, and run freely, it sticks merely to the edges of the metal without incorporating itself with it. Such a weld, too, often finishes well with a fine, ridgey seam, and comes down nicely under the "recovery" hammering. But if set in a vice and hit flatwise, it will suddenly bend, if it does not snap off like a rotten stick. Personally, therefore, I prefer a smaller trench, but formed on both sides if the nature of the job will allow.

Likewise—one is sorry to say we have not got very far—there

is such a thing as starting the job after all these preparations are made, so that when it is finished, there will be neither over-lapping, warping, or prolongation of one end beyond the other. Here comes in—even if the pieces be not otherwise secured, which is often a difficult and unsatisfactory business—the fine art of "tacking," or making four or more rapid intermediate joining melts, the middles before the ends.

Which done, there is the making of a nice gradual, pushing rather than chasing seam—slower in appearance, but wonderfully rapid in the rear—with the flame just far enough from the vertical to effect the push. There is also the art of oscillation as you go, still pushing; of curling and shaping up, with just an occasional, almost imperceptible pull-back to keep the heat in the weld just behind the fluid melt, to make sure of thorough incorporation. There is, at the same time, the deft management of the filling rod and the flux.

Again, there is the instantaneous occasional wipe of the blow-pipe nozzle—for which purpose there is nothing better than a soft leather or asbestos pad—and the detection of the need for that wipe, equally rapid. Likewise, simultaneously, to maintain the melt and keep the flame just so, without letting the metal splutter unduly. Also to overcome the awful fatigue of holding the featherweight of the blow-pipe just "there," and to keep running on.

You will thus be able to judge whether sound autogenous welding is just a matter of buying even a very good outfit and having a few weeks' practice—at a munitioneering factory, or whether it is not really the sole product of specialist experience. But don't be nervous: don't worry: go right on, and make up your mind to serve seven years for the Rachel of your craft. Then you may begin to know something about her. Until then, don't trust her. At any rate, not in any motor-car or aeroplane part that is subject to sudden stress or shock. That is where confidence—or self-credulity—means manslaughter.

DOPE.

By A. J. A. WALLACE BARR.

Five years ago, at the request of the Editor, I ventured to write a short article on "Dopes and Doping," and although in those days the present method of doping aeroplanes was only in its infancy, I am afraid there is very little which can now be added. The essential details remain the same, and now that I have been asked to amplify my remarks of five years ago, I feel a certain amount of diffidence in doing so in view of the large amount of scientific research and supervision which have been brought to bear in connection with this work. This causes a mere dope manufacturer like myself to feel that it is almost an impertinence to attempt to add anything to my previous remarks.

There is no doubt, however, that in the early days of doping sufficient attention was not given to the essential details which ensure success, and it is quite apparent that the A.I.D. have greatly improved the efficiency of doping by their supervision of dope shops. This supervision may perhaps have been irksome to contractors, but, taking it all round, it has greatly improved the conditions under which the doping is carried out, and has also prevented wastage of dope.

In the old days a contractor gave instructions that a certain number of coats to be applied, but he did not take sufficiently into consideration the human element which causes one doper to apply much thicker coats than another, with the result that very often the weight of deposit was far higher than was necessary. Under the existing doping schemes, only two ounces per square yard of dope deposit are necessary, and, in order to prevent wastage, great care should be taken to weigh the plane after each coat of dope, so that doping may be discontinued as soon as the requisite weight is obtained.

In connection with the weight of dope deposit, there is a paragraph in my previous article which is now incorrect, as it has been found that the weight of dope deposit on the fabric can be safely reduced. My previous article stated that the weight of doped fabric should be 100 per cent. greater than the weight of undoped fabric, but under the present conditions the specifications only call for an approximate increase of 50 per cent. when the fabric is doped, and a further 25 per cent. when the pigment covering is added.

The pigment covering was referred to in the 1912 article, but it was not until the beginning of the war that this material began to be largely used, and in this respect credit must be given to the R.A.F. for producing an article which has proved satisfactory. The material in question is P.C.10, which solution has formed the basis of the pigmented coverings used in the different doping schemes.

The pigmented coverings serve a twofold purpose. They form an admirable protection for dope against light and other deleterious agents, and also reduce the visibility of the machine when viewed from above.

The main points to which great care should be given in the dope shop are the matters of temperature and ventilation. The temperature ought to be maintained at between 65/70 degrees Fahrenheit, and the atmosphere should be as dry as possible. Ventilation is still advisable and insisted on by the Home Office.

There is no doubt with the new ventilating system now in force the old type dopes containing tetrachlor-ethane, etc., could be used with perfect safety, and it is rather a pity that steps were not taken to improve the ventilation of the dope shops at an earlier date, so that the use of the old type dopes would be permitted, as undoubtedly these were far more efficient.

Before doping is commenced great care should be taken to see that the fabric is perfectly dry and free from any oils and fats. During the past few months trouble has been caused through the fabric containing spots of lubricating material used on the looms. This prevents the dope from drying properly, and it is very difficult to get this fatty matter out of the fabric. Great care should be taken to rub the first coat of dope well into the fabric, so that both sides are thoroughly impregnated, and subsequent coats should be laid on as evenly as possible, until the requisite weight of two ounces per square yard is obtained.

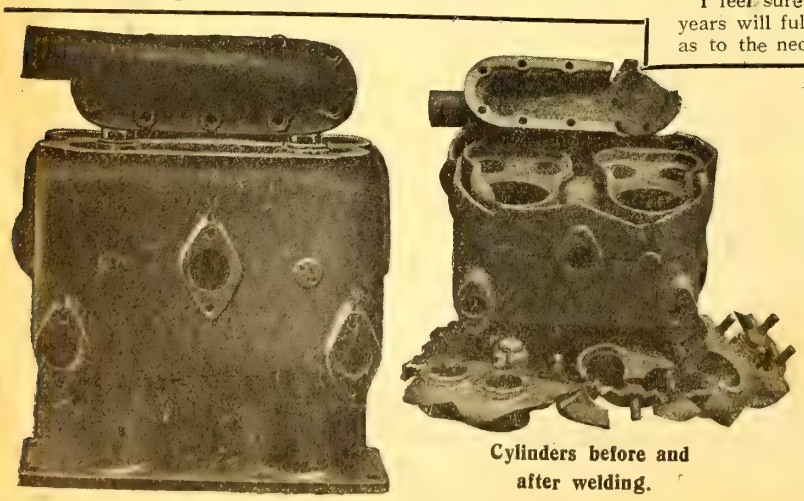
With regard to the question of the number of coats which should be applied and the thickness of each application, this is a point that has caused a considerable discussion, and I venture to suggest that more efficient results are obtained when several coats are applied very thinly, and although this may appear to reduce the output, it is important to remember that the final efficiency of the machine and its weathering capabilities are the objects in view.

With regard to the utensils used in the dope shop, it should be mentioned that a painter's wide-mouthed can is certainly not suitable for volatile solutions like dope, as a large area is exposed for evaporation, and the material rapidly concentrates and gives unsatisfactory results. I might also mention that aeroplane builders suffer a considerable loss during the course of the year through materials being allowed to remain in these cans over night, instead of being emptied back into drums. If materials are allowed to stand in open cans during the night, they are unsuitable for use the next morning and have to be scrapped.

Clean utensils are essential for satisfactory doping, and every care should be taken to see that the drums containing dope, etc., are screwed up as soon as a supply has been withdrawn. This will prevent evaporation, and ensure the material remaining in good condition.

With the coloured and pigmented materials great care should be taken to stir these before use.

I feel sure the A.I.D., with their experience over the last few years will fully bear me out as to the last few remarks, specially as to the necessity for cleanliness and prevention of evaporation.



Cylinders before and after welding.

SCIENTIFIC WELDING.

The accompanying photographs show a particularly bad smash which the Barimar Welding Experts, of 10, Portland Street, London, W., have been able to make good.

Figure 1 depicts a pair of cylinders with combustion heads blown completely out, and smashed water-jacket and water-plate.

Figure 2 shows a photograph of the whole heap of ruins reconstituted, machined and cleaned, and made in every respect practically as good as new.

It seems clear that no metal part however large or badly fractured should be scrapped until it has been examined by a firm of welders which really knows its job.

The · Aeroplane ·

Acetylene Welding Plant—

Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—

Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation, Newcastle-on-Tyne."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2 City 7724.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.

Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."

Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."

Martinsyde, Ltd., Brooklands, Byfleet. Woking 331; Byfleet 171. "Martinsyde, Weybridge."

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455 "Nieuscout, Crickle, London."

Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."

The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. Putney 2240-2241, "Carbodis, London."

Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerfyta, Knights, London."

Waring & Gillow, Ltd., Hammersmith. Museum 5000. "Warisen, Ox, London."

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

White, J. Samuel, & Co., Ltd East Cowes. Cowes 3. "White, East Cowes."

Airships—

Airships, Ltd., High Street, Merton, Wimbledon 1314.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, 'Phone, London."

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Bizfibild, London."

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.

The Wilfley Co., Ltd., Salisbury House, London Wall, E.C.2 City 2681-2. "Wrathless, Phone, London."

Cable Coverings and Cable Controls—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Capstan Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Castings (Aluminium, Brass, Bronze, Machined or Rough)—

Coan, R. W., 219, Goswell Road, London, E.C.1 City 3846. "Krankases, Isling, London."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."

London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."

Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."

B. D. V. Aircraft Spares, Syon Chambers, 16a, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—

British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."

British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Clarke, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Elastic Cords—

Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—

Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. Midland 981. "Fahrenheit, Birmingham."

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—

E. Kalker & Co., Coventry. Coventry 241. "Kalker, Coventry."

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford No. 1. "Pump, Bedford."

Arrol-Johnston, Ltd., Dumfries. Dumfries 281-182. "Mocar, Dumfries."

The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000.

Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. Gerrard 238. "Beardmore, London."

Dudbridge Iron Works, Ltd. (Salmson), 87, Victoria Street, London, S.W.1. Vic. 7026. "Aeroflight, Vic., London."

Gordon Watney & Co., Ltd., Weybridge. Weybridge 550 (7 lines). "Mercédès, Weybridge."

Green Engine Co., Ltd., Twickenham. Richmond 1293.

Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. Hammersmith 1910. "Gwynne, Hammersmith."

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sturtevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Moorfield, Wolverhampton."

The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W.. Walthamstow 408 (2 lines). "Elevenfold, London."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Flexible Shafts—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Flying Schools—

Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. Bournemouth 1160 "Etches, Winton."

Cambridge School of Flying & Aerodrome Co., Ltd., 30b, St. Andrews Street, Cambridge.

Galvanising—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Cowper-Coles Manufacturing Co., Sunbury-on-Thames. Sunbury 37.

Gears—

Moss Gear Co., Ltd., Thomas Street, Aston, Birmingham. East 407. "Mosgear, Birmingham."

Glue—

Improved Liquid Glues Co., Ltd., Gt. Hermitage Street, E. (Croid.). Avenue 3178. "Excroiden, Wapp, London."

Mendine Co., 8, Arthur Street, E.C. Bank 5873.

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines). "Comyn, Ching, Westcent, London."

Chas. P. Kinnell & Co., Ltd., 65 & 65a, Southwark Street, London, S.E.1. Hop 372 (2 lines). "Kinnell, London."

Instruments—

British Wright Co., Ltd., 33, Chancery Lane, W.C.2. Holborn 1308.

Instruments (Scientific, Altimeters, Speed and Pressure Gauges, etc.)—

Short & Mason, Ltd., Macdonald Road, Walthamstow, E.17. Walthamstow 180. "Aneroid," Phone, London.

Machine Tools—

Brewster & Co., 11, Queen Victoria Street, E.C.4. City 768. "Circumfuse, Cannon, London."

Magneto Driving Pieces—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Magnetos—

The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. 1008-1009 Coventry. "Corlton, Coventry."

The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. Museum 430. "Vicksmag, Phone, London."

Metal Manufacturers—

Chas. Clifford & Sons, Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

Metals in General—

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

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Metal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."
Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."
Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2297.
Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041. "Bayliss, Wolverhampton."
The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow, London. Hounslow 254. "Golshel, Hounslow."
Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. Museum 70. "Installing, Eusroad, London."
Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261. "Fremo, Birmingham."
Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."
Selsdon Engineering Co., Ltd., Croydon. Croydon 1761-123. "Selig, Cent, London."
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."
Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

Metal Shearing Tools—

Montgomery, Smith & Co., Ltd., Tangent Works, Keynsham, near Bristol. Keynsham 21. "Ingenuity, Salford."

Metal Spinnings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Metric Bolts—

Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

Miscellaneous—

Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."
Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C. Central 3731.
Bowdon Wire, Ltd., Willesden Junction. Willesden 2400 (3 lines). "Bowirelim, Harles, London."
Brown Bros., Ltd., Great Eastern Street, E.C.1. London Wall 6300. "Imbrowned, Bethroad, London."
Edison Swan Electric Co., Ponder's End. (Lamps). Enfield 520 (6 lines). "Ediswan, Enfield."
Herbert Frood Co., Ltd., Chapel-en-le-Frith. Central 793. "Frodobrake, Birmingham."
Glasso Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.
London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—

Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
Standard Motor Car Co., Coventry. Coventry 530 (4 lines). "Flywheel, Coventry."

Observation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Packers, Shippers, Etc.—

Lep Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depolep, London."

Patent Agents—

King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.
Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.
Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Petrol Storage (Bulk)—

Bywater & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. Gerrard 2220. "Bywaterist, London."

Piston Rings—

British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—

Bliss, E. W., Co., 2a, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissdon, London."

Presswork—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."
Integral Propeller Co., Ltd., Hendon 9. Kingsbury 104. "Aviprop, Hyde, London."
Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."
Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Stanley Aviation Co, 67, Kingsland Road, E.2. City 8347.
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—

C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. Chapeltown 474. "Instrument, Leeds."

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The Norman Thompson Flight Co., Ltd., Middleton, Bognor. Bognor 48. "Soaring, Bognor."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Short Bros., Rochester. Chatham 627. "Seaplanes, Rochester."
Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Shackles—

The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. Hounslow 254. "Golshel, Hounslow."

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.
Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sheet Metal Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Shock Absorbers (Elastic Cord)—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—

Forward Motor Co., Summer Row, Birmingham. Central 6259.
Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.
Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."
Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—

Dart Spring Co., West Bromwich. West Bromwich 322. "Dart, West Bromwich."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—

Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."
Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield"

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—

Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—

John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.
James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London"
R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."
The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Weskent."

Varnishes—

Clarke, R. Ingham, & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."
Harland, W., & Son, Merton. Wimbledon 45.
Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."
Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Washers—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Watchmakers and Jewellers (Silver Models)—

Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—

Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."
London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—

Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wiremill, Musselburgh."
Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Wirework—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Woodworking Machinery—

Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."
Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."
Wadkin & Co., Leicester. Leicester 3614. "Woodworker, Leicester."

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Acetylene Welding Plant—
Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—
Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."
Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation. Newcastle-on-Tyne."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."
British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."
Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.
Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2 City 7724.
Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.
Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."
Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."
Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."
Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."
Martinsyde, Ltd., Brooklands, Byfleet. Woking 331; Byfleet 171. "Martinsyde, Weybridge."
National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6745.
"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455 "Nieuscout, Crickle, London."
Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."
The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. Putney 2240-2241. Carbodis, London."
Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."
Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."
Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."
Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."
Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerlyte, Knights, London."
Waring & Gillow, Ltd., Hammersmith. Museum 5000. "Warisen, Ox, London."
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."
White, J. Samuel, & Co., Ltd. East Cowes. Cowes 3. "White, East Cowes."

Airships—
Airships, Ltd., High Street, Merton. Wimbledon 1314.
Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Aluminium Castings—
Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankoses, Isling, London."
Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—
Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."
Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

Bearings (Etonia Cast Phosphor Bronze)—
Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Fairey Construction Co., Ltd., 127, Victoria Street, S.W.1. Victoria 8868. "Bizfibild, London."
Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.
The Willey Co., Ltd., Salisbury House, London Wall, E.C.2. City 7681-2. "Wrathless, Phone, London."

Cable Coverings and Cable Controls—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

Capstan Work—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."

Carburettors—
Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."
Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Castings (Aluminium, Brass, Bronze, Machined or Rough)—
Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankoses, Isling, London."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—
Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—
Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."
London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—
Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.
Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."
Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4072.
Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."
B. D. Aircraft Spares, Syon Chambers, 16a, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."
Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercacons, Canning, London."
The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—
MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—
British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."
British Celluloss Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutote, London."
Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."
Clarke, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Elastic Cords—
Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—
Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. Midland 981. " Fahrenheit, Birmingham."
The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex, Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—
E. Kalker & Co., Coventry. Coventry 242. "Kalker, Coventry."

Engines and Parts—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford No. 1. "Pump, Bedford."
Arrol-Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000.
Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. Gerrard 238. "Beardmore, London."
Dudbridge Iron Works, Ltd. (Salmson), 87, Victoria Street, London, S.W.1. Vic. 7026. "Aeroflight, Vic., London."
Gordon Watney & Co., Ltd., Weybridge. Weybridge 550 (7 lines). "Mercedès, Weybridge."
Green Engine Co., Ltd., Twickenham. Richmond 1293.
Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. Hammersmith 1910. "Gwynne, Hammersmith."
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.
Sturtevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.
Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Moorfield, Wolverhampton."
The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W. Walthamstow 408 (2 lines). "Elevenfold, London."
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Flexible Shafts—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

Flying Schools—
Bournemouth Aviation Co., Ltd., Talbot Villages, Bournemouth. Bournemouth 1160 "Etchells, Winton."
Cambridge School of Flying & Aerodrome Co., Ltd., 30b, St. Andrews Street, Cambridge.

Galvanising—
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Cowper-Coles' Manufacturing Co., Sunbury-on-Thames. Sunbury 37.

Gears—
Moss Gear Co., Ltd., Thomas Street, Aston, Birmingham. East 407. "Mosgear, Birmingham."

Glue—
Improved Liquid Glues Co., Ltd., Gt. Hermitage Street, E. (Croid.). Avenue 3178. "Excroiden, Wapp, London."
Mendine Co., 8, Arthur Street, E.C. Bank 5873.

Goggles—
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Heating and Ventilating—
Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines). "Comyn, Ching, Westcent, London."
Chas. P. Kinnell & Co., Ltd., 65 & 65a, Southwark Street, London, S.E.1. Hop 372 (2 lines). "Kinnell, London."

Instruments—
British Wright Co., Ltd., 33, Chancery Lane, W.C.2. Holborn 1308.

Instruments (Scientific, Altmeters, Speed and Pressure Gauges, etc.)—
Short & Mason, Ltd., Macdonald Road, Walthamstow, E.17. Walthamstow 180. "Aneroid." Phone, London.

Machine Tools—
Brewster & Co., 11, Queen Victoria Street, E.C.4. City 768. "Circumfuse, Cannon, London."

Magneto Driving Pieces—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

Magnetos—
The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. 1008-1009 Coventry. "Corlton, Coventry."
The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. Museum 430. "Vicksmag, Phone, London."

Metal Manufacturers—
Chas. Clifford & Sons, Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

Metals in General—
Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. " Poetry, Fen, London."

Metal Parts and Fittings—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."
Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."
Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2297.
Baylis, Jones & Baylis, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041. "Baylias, Wolverhampton."
The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow, London. Hounslow 254. " Golshel, Hounslow."
Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. Museum 70. " Installing, Eusroad, London."
Mountford, Fredk., Ltd., Fremo Works, Lilford, Birmingham. Kings Norton 261. "Fremo, Birmingham."
Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."
Selsdon Engineering Co., Ltd., Croydon. Croydon 1761-123. "Selig, Cent, London."
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."
Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

Metal Shearing Tools—
Montgomery, Smith & Co., Ltd., Tangent Works, Keynsham, near Bristol. Keynsham 21. " Ingenuity, Salford."

Metal Spinnings—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."

Metric Bolts—
Cashmore Bros., Zeta Works, Hildreth Street, Balham, S.W. Battersea 415.

Miscellaneous—
Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."
Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C. Central 3731.
Bowdon Wire, Ltd., Willesden Junction. Willesden 2400 (3 lines). "Bowirelim, Harles, London."
Brown Bros., Ltd., Great Eastern Street, E.C.1. London Wall 6300. "Imbrowned, Bethroad, London."
Edison Swan Electric Co., Ponder's End. (Lamps), Enfield 520 (6 lines). "Ediswan, Enfield."
Herbert Frood Co., Ltd., Chapel-en-le-Frith. Central 793. "Frodobrnke, Birmingham."
Glasso Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.
London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—
Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
Standard Motor Car Co., Coventry. Coventry 530 (4 lines). "Flywheel, Coventry."

Observation Panels—
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Packers, Shippers, Etc.—
Lep Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depolep, London."

Patent Agents—
King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.
Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.
Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Petrol Storage (Bulk)—
Bywater & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. Gerrard 2220. " Bywaterist, London."

Piston Rings—
British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—
Bliss, E. W., Co., 2a, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissdon, London."

Presswork—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

Propellers—
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Eborn Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."
Integral Propeller Co., Ltd., Hendon 9. Kingsbury 104. "Aviprop, Hyde, London."
Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."
Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Stanley Aviation Co., 67, Kingsland Road, E.2. City 8347.
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

Rigging for Aircraft—
Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—
The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—
C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—
Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankoses, Isling, London."

Scientific Instruments—
The Foster Instrument Co., Letchworth, Herts. Chapeltown 474. "Instrument, Leeds."

Seaplane Manufacturers—
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The Norman Thompson Flight Co., Ltd., Middleton, Bognor Bognor 48. "Soaring, Bognor."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Short Bros., Rochester, Chatham 627. "Seaplanes, Rochester."
Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—
Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Shackles—
The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. Hounslow 254. " Golshel, Hounslow."

Sheet Metal Pressings—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.
Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sheet Metal Work—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."

Shock Absorbers (Elastic Cord)—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—
Forward Motor Co., Summer Row, Birmingham. Central 6259.
Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.
Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."
Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—
Dart Spring Co., West Bromwich. West Bromwich 322 "Dart, West Bromwich."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."
Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—
Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."
Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—
Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Steel Tubes for Aeroplanes—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—
Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lilford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—
John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.
James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—
Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London."
R. P. & F. W. Brown, Wollaston Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—
Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—
The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."
The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Westkent."

Varnishes—
Clarke, R. Ingham, & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."
Harland, W., & Son, Merton. Wimbledon 45.
Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."
Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Washers—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

Watchmakers and Jewellers (Silver Models)—
Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—
Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

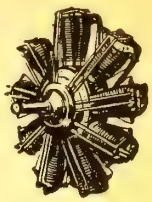
Wind Shields—
Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."
London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—
Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wiremill, Musselburgh."
Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Wirework—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

Woodworking Machinery—
Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."
Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."
Wadkin & Co., Leicester. Leicester 3614. "Woodworker, Leicester."

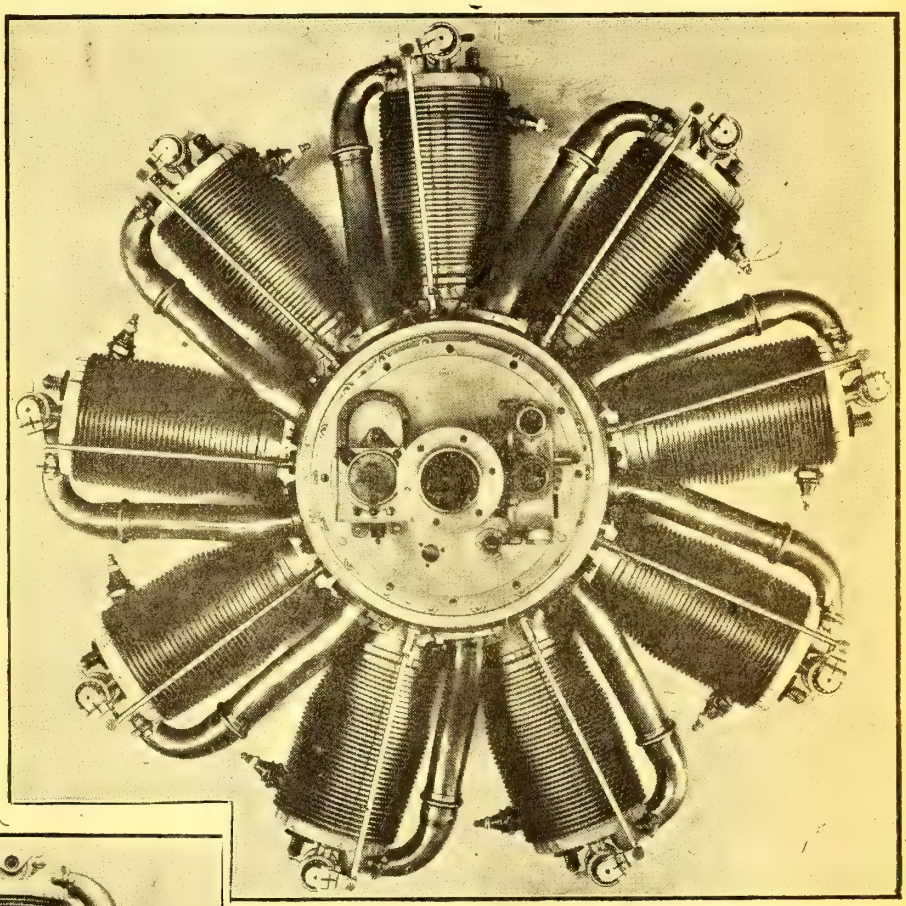
AERO-MOTORS
IN KIND AND CONSTRUCTION



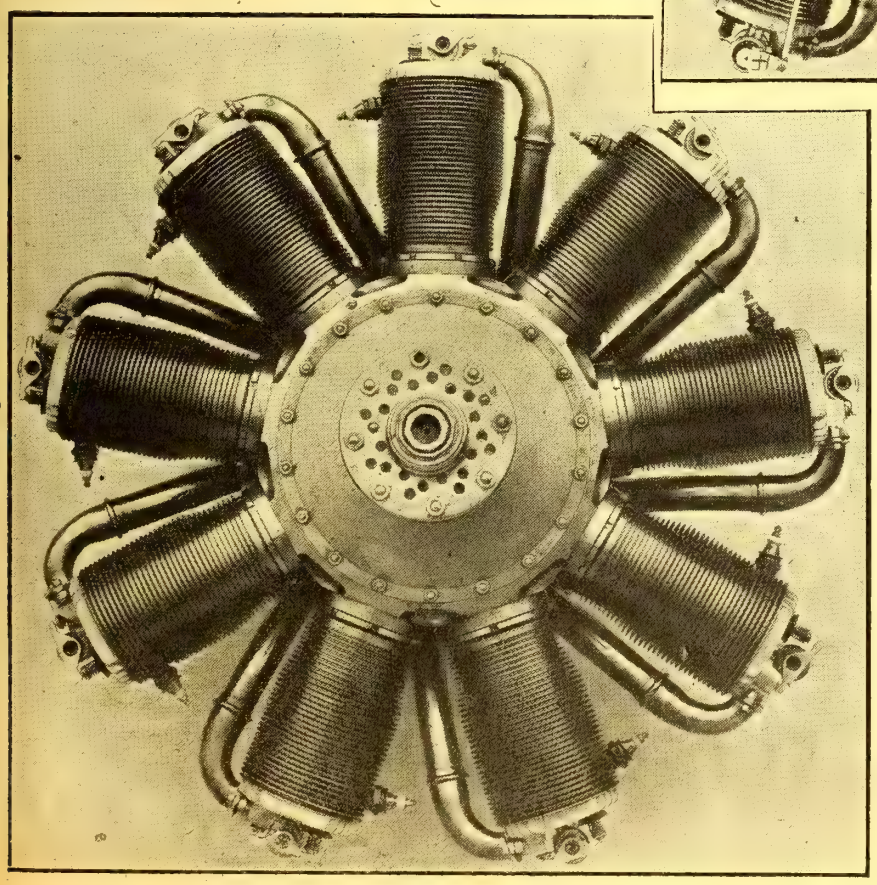
By Geoffrey de Holden-Stone

On this and following pages appear excellent illustrations of the two probably best-known rotary aeromotors, the Le Rhône and the Clérget: both, since the war, of British manufacture. Development—which is not always the same thing as design—moves so fast nowadays; and where possible to pile the mechanical Pelion upon Ossa, to such powers, that even these, as models, have become almost classic in a brief three years. Still—as anyone with the least idea of the number to which both are being manufactured would agree—it seems evident that they have not been improved upon, as types of their kind. Both were extensively dealt with in these columns from eighteen months to two years ago, when, so many having joined up with the Flying Services with no better qualification than their Country's need, it became necessary to discuss whys and wherefores of design as some helpful basis of maintenance, to a greater extent than the usual specification—the summit of descriptive concealment—manages to afford.

In those days, and since, gladly I did what little some twenty-five years' practical specialised study of these matters, a qualifying degree or so, and personal touch with the technical developments in five countries enabled me to do. Even then—so fast does knowledge come, if wisdom lingers—I occasionally found I did not know so much as the youngest. Still, I took courage, in the appreciation of the majority



The 110-h.p. Le Rhône (Back View).



The 110-h.p. Le Rhône (showing Propeller end).

who shared my ignorance, to continue. But those days are past. Probably many of my then readers have perished doing their duty behind the machines we studied together. So many, indeed, that a new and possibly more compulsory call than they ever needed has arisen for others to take their place. Doubtless among the rest, to those whose belated apprenticeship to engineering began in August 1914. Their experience as machine-minders on repetition work would, of course, be of the greatest value in the R.F.C. and R.N.A.S.: so—as our correspondence proves—they no doubt constitute a new set of readers. After all, they are "the practical men, working among these machines, so their opinion counts most": as my Editor, better assured of their technical qualifications and accuracy than of mine, is careful to tell me when they write up to contradict flatly anything I happen to have written the week before. This being so, one is certain of their interest in seeing the bits and pieces which they have watched grow into being, in the altogether. Otherwise they know all about them. So I need not waste their time or mine with more than the briefest once-over specification of what part goes where in either case. Then I can hardly go wrong.

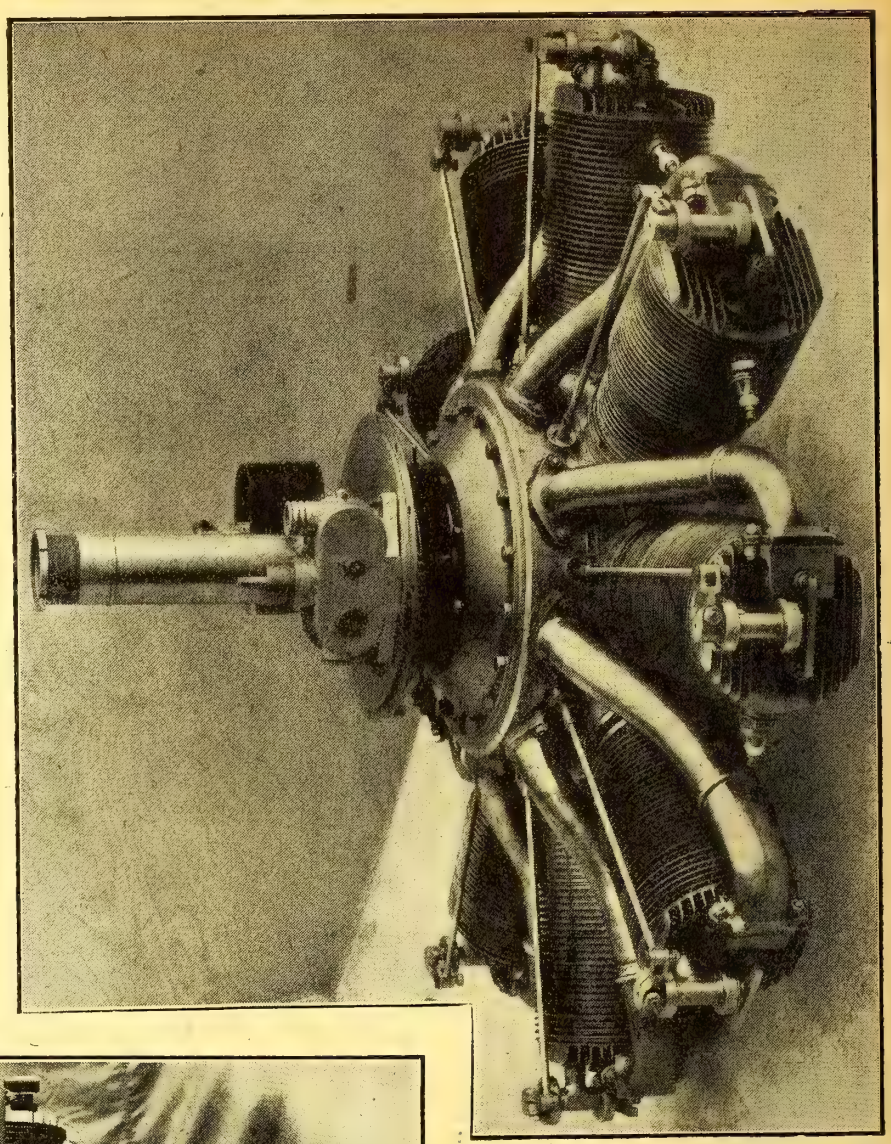
Unfortunately, Anno Domini—and the opinions of several ostensibly qualified medical men during the last three years—

exempts me, too, from everything; even being cocksure about anything. Otherwise I would say I am sure they could find no better models to study critically. I have seen no sign that any of them will design anything better. Still, if they know a better, let them go to it.

To begin with the—I believe—older Le Rhône, made in Paris by the Société des Moteurs Gnôme et Rhône, 3, Rue la Boétie: here by the Gnôme and Le Rhône Engine Co., Ltd., 47, Victoria St., S.W.: in Italy by La Societa Italiana Motori Gnôme è Rhône, of 73, Strada Veneria, Madonna di Compagna: and in America by the General Vehicle Co., of Long Island City. Thus introduced, we see on this page the 9-cylinder model rated at 110 h.p. at 1,200 r.p.m. on a piston-sweep of 105 mm. by 140 mm.; albeit, it has given as much as 130 h.p. Here, to show the progress of the last three years, be it noted that the 18-cylindered Gnôme of 1914 only gave another 30 h.p.

Like the Gnôme, however, it gets its induction from the crank-chamber, but externally in the more or less conventional four-stroke manner of reversed gas-flow, whereas the Gnôme, both old pattern and monosoupape, are uniflow, and therein unique in their cycle. It will be seen that for each cylinder a single push-and-pull tappet rod operates both inlet and exhaust by a rocket with a ball-borne sleeve-mounting.

Internally, the valve gear, operating all these rods consecutively, consists of a single cam-plate with two cam-ramps—also plate-like—bolted to its channelled edge—with as many cam formations on each as there are rods. Each cam-ramp operates one set of arms of bell-cranks, to one of which sets the rods are pinned. The cam-plate itself—ball-race-borne—is mounted on a slightly eccentric prolongation of the crank-shaft, and is operated by an internally toothed ring-gear bolted to

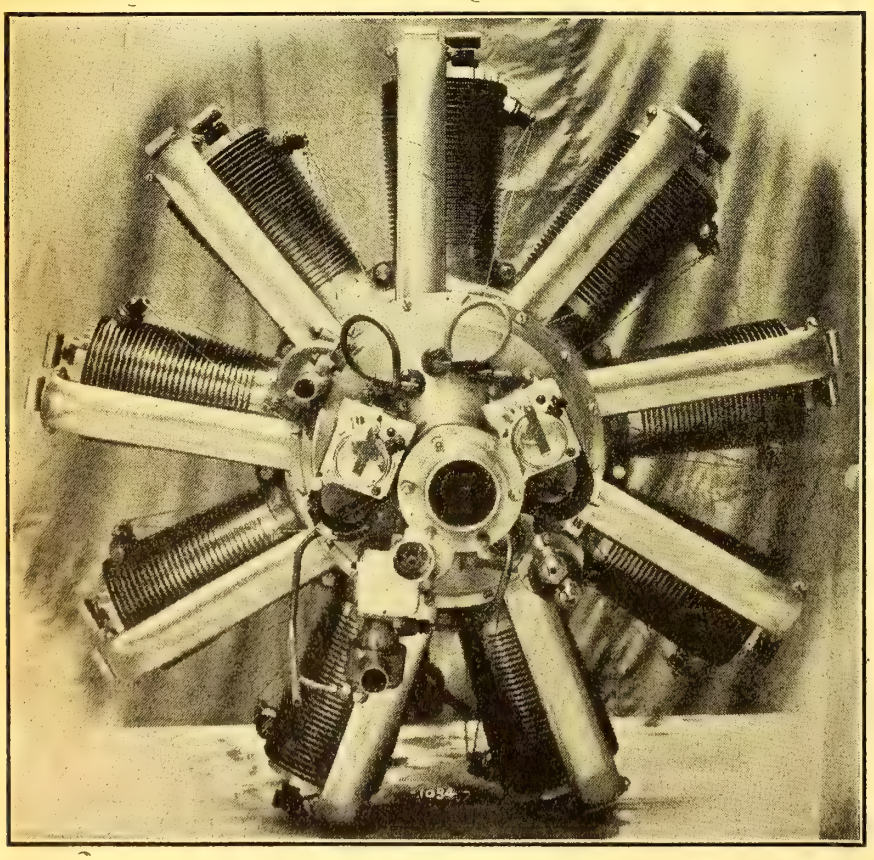


The 110-h.p. Le Rhône (showing Inlet Pipes and Cylinder Heads).

it, which is engaged by a spur-gear mounted solid on a further prolongation of the shaft; *concentric*, however, to the shaft axis. This last gear is, of course, eccentric relatively to the toothed ring: so the rotation of the motor-mass gives all the complete motion of an eccentric and at the same time rotary spinning throw—as one twirls a curtain ring on the finger—but in the opposite direction to the motor's rotation, at $\frac{7}{8}$ of the latter's speed.

The connecting rods are attached by rectangular feet, inserted between the steps of the internally stepped halves of a drum, carried on ball bearings on the crank-pin. All except the seventh—or ninth—master rod, which is bolted down to the halves of the drum to unite them. As neither drum, nor rods, nor pistons reciprocate, but merely rotate end-long, this construction is strong enough to serve all purposes with no risk of those lock-up bolts working loose.

For the rest the motor-mass is carried in the typical way, on crank-chamber ball bearings behind, in the first place; and secondly by a double thrust bearing and a fourth ball bearing on the main shank of the shaft supporting the whole. This shank is hollow, and serves as an induction trunk from the carburettor. This is, or was, a Tampier, automatic, and needle-controlled as to the petrol supply; air sup-



The 130-h.p. Clerget-Gwynne (Back View showing Inlet Pipes).

ply and mixture being controlled by a guillotine-type throttle.

The shaft-shank also serves as a conduit for the lubrication pipes—but not for the oil itself—which lead to a collector-ring within the main ball bearing. From this point the oil runs through leads in the crank-webs to all other bearings, and from the bottom of these webs through quill-like tubes to each cylinder-wall in turn.

The ignition—from two H.T. magnetos as shown—runs to the usual stationary plate and contact plug, which makes contact with the segments on the rotating distributor in the usual way.

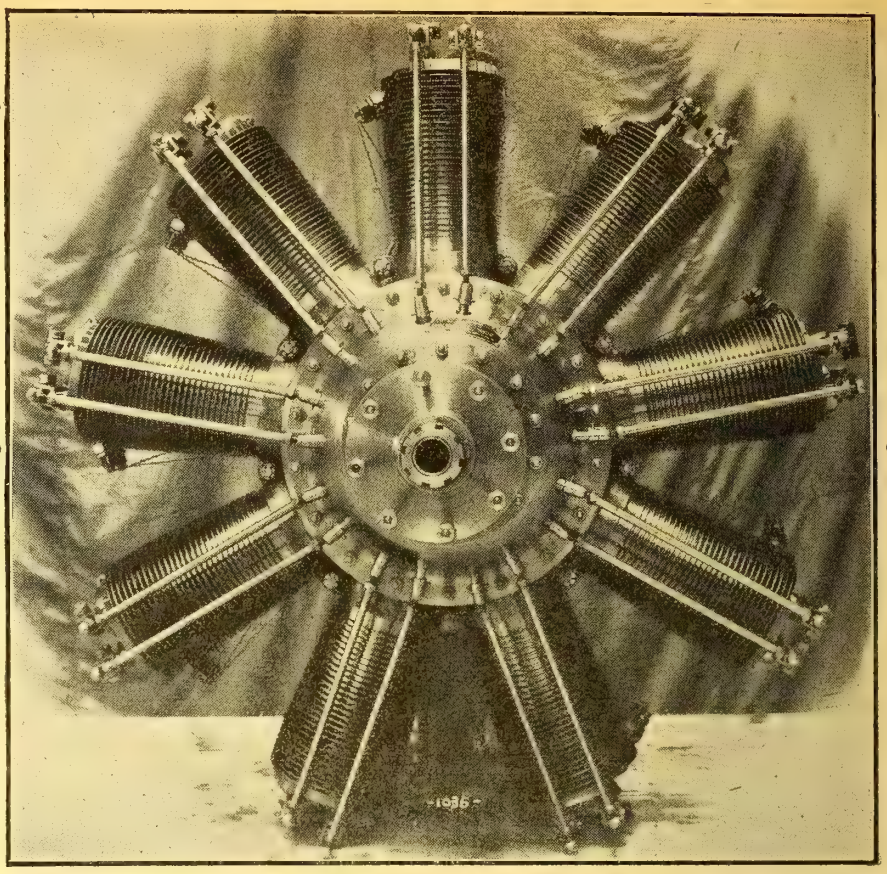
The Clerget.

While, of course, working in the same way, and of much the same mass construction, the detailed design of the Clêrget motors is entirely different from the Le Rhône. The carburettor is not a constant level-type, but has a rotary throttle controlling air, mixture and petrol supply, the last by moving a special spray-piece up and down the jet proper. The ignition is distributed much in the same way: one contact-plug for each magneto.

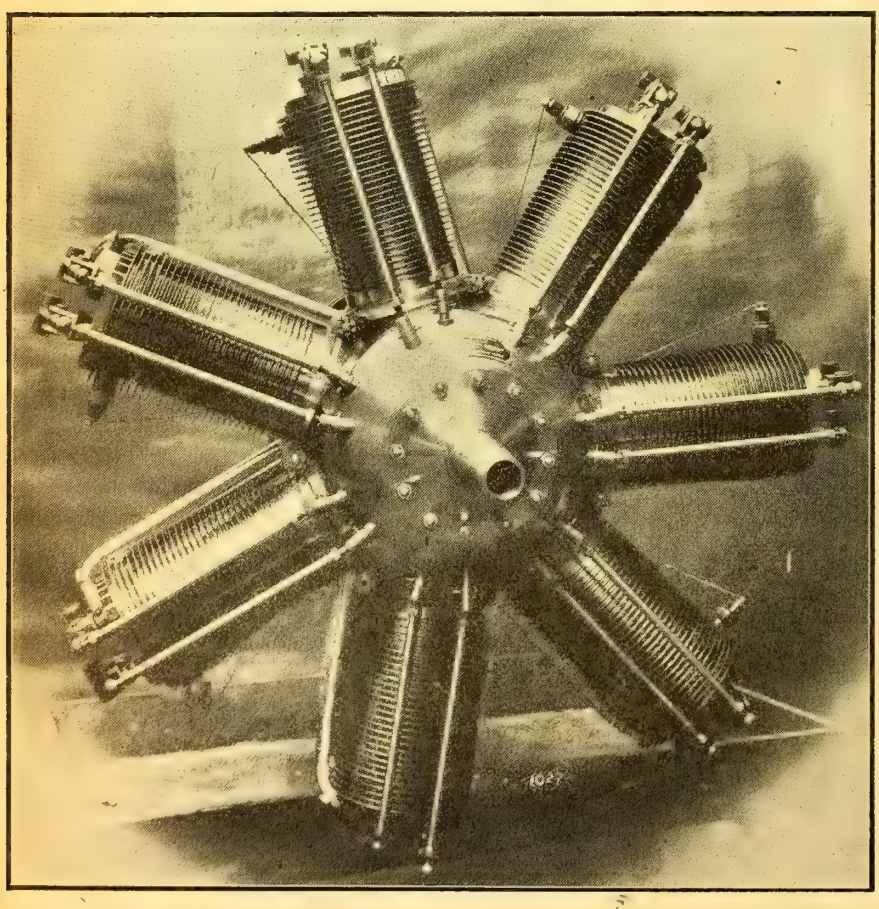
But the connecting rods are all of the same length, and pinned into the halves of a drum exactly in the Salmson manner. The cylinders are likewise flat-topped but wider, and each valve is opened by a separate tappet rod: all the rods being on the front side, opposite the flat induction pipes at the back. The valve-gear motion is entirely different, to operate these rods. Not only is it the converse of the Le Rhône scheme, but the parts involved are of different design: these being a three-armed star-cam, mounted *eccentrically* on an extension of the crank-shaft—which is concentric, nevertheless, to the axis of the latter—but free to rotate; and so giving the same kind of spinning throw to an internally ramped cam-plate—ramped in alternate lifts and hollows—into the hollows of which the tappet rods are projected. Thus, as the motor rotates the arms of the star-cam alternately lift the entire plate on the cam-lifts or drop into the intermediate hollows to lift the tappets. In other words the star-cam has a relatively epicycloidal movement as to the crown or cam-plate. So much, then, as to how the Le Rhône and Clêrget motors respectively work. Remains only to say that the latter's cylinder measurements are 120 mm. by 150 mm.: the weight of the 7-cylinder model being 234 lbs. and that of the latter 395 lbs.: overall measurements in the one case being 920 mm. by 810 mm. and in the other 1,020 mm. and 1,160 mm. Otherwise we have seen how both models are shaped in mass and detail, and where they differ. With not a word of why, to disturb the brain of the wisest and youngest of ex-machinists; the future democracy of aviation, to whom my salutations of the most—distinguished.

One may add that the Clêrget is the product of Mm. Clêrget, Blin et Cie, 37, Rue Cavé, Levallois, Seine, and that the proprietors of the British rights, and also the leading manufacturers, are the famous engineering firm of Gwynnes Ltd., Hammersmith Iron Works, London, W., who have produced engines which surpass in performance their French-built prototypes.

(To be continued.)



The 130-h.p. Clêrget-Gwynne (Front View showing Valve Rods).



The 90-h.p. Clêrget-Gwynne (7-Cylinder Type).

A RECTIFICATION.

Owing to an error in transcription the statement appeared in The Aeroplane recently that the 8-ply bullet-proof Triplex panels for armoured cars are 5 ins. thick. These panels are, in fact, only 2 15/16 ins. thick.

When one considers that this thickness of Triplex stood the impact of a Mauser bullet at 25 yards in both directions, one begins to appreciate the astonishing resistance of the material. Its resisting power is vouched for by an official letter from the Trench Warfare Research Department.

THE PATENTS INDEX.

The subjoined list of recent inventions has been specially compiled by The Aeroplane from the current Official Patents Records.

Patent Applications.

Abrahams, E. G. Balloons and airships. No. 11095. August 1st.
Back, W. E. Flying machines. No. 11113. August 2nd.
Back, W. E. Control of flying machines. No. 11172. August 2nd.
Baker, T. Y. Sighting device for use in aircraft. No. 11018. July 31st.
Blackburn Aeroplane and Motor Co. Pulleys for control of flexible connections of aircraft, etc. No. 11008. July 31st.
Blackburn Aeroplane and Motor Co. Aeroplane flying machines. No. 11009. July 31st.
Blackburn Aeroplane and Motor Co. Hoisting or lifting gear for aircraft. No. 11147. August 2nd.
Blackburn Aeroplane and Motor Co. Method of construction of boats or floats. No. 11215. August 3rd.
Bramble, Y. Observation balloon and fittings. No. 11248. August 3rd.
Brock, A. Aerial photography. No. 11265. August 3rd.
Bryce, J. A. Wings or planes of aeroplanes. No. 11094. August 1st.
Chester, W. E. Method of manufacture of propellers. No. 11055. August 1st.
Chester, W. E. Landing gear for aircraft. No. 11056. August 1st.
Dodson, E. Altitude control for carburettors. No. 11301. August 4th.
Firth, B. Aeroplanes. No. 11137. August 2nd.
Genner, L. J. E. Safety belt for use on aeroplanes. No. 11232. August 3rd.
Gledhill, A. H. Apparatus for releasing bodies from aircraft. No. 11175. August 2nd.
Hall, W. R. Fastener for wires of aircraft. No. 11047. July 31st.
Newbold, H. Goggles for airmen, motorists and others. No. 11164. August 2nd.
Newman, T. F. Substitute for canvas and fabric used in construction of aircraft. No. 11173. August 2nd.
Newman, T. F. Composition and method of replacing wood in construction of aircraft. No. 11174. August 2nd.
Sage and Co., F. Aircraft. No. 11096. August 1st.
Shortt, A. G. Method of keeping nose of airship or kite-balloon convex against wind pressure. No. 10918. July 30th.
Wood, W. H. Manufacture of propellers, etc., of aircraft. No. 10969. July 30th.

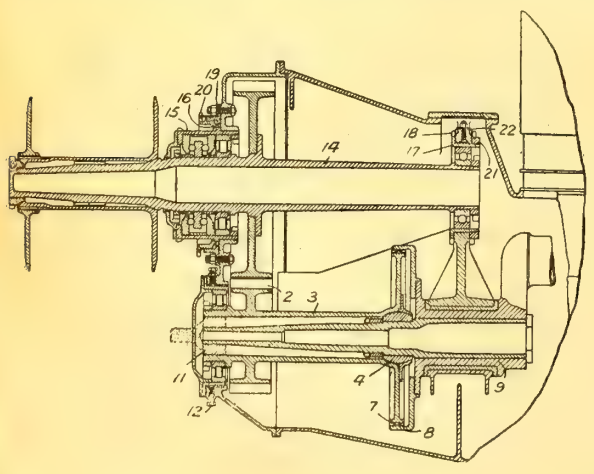
Complete Specifications Accepted, prints of which are obtainable on and after August 23rd, 1917.

108,232. Sept. 19th, 1916. Reynolds, A. J. Searchlight in combination with gun for use against aircraft.
108,245. Oct. 17th, 1916. Wilson, W. A. Ordnance for land, aerial and marine purposes.
108,259. Nov. 23rd, 1916. Rooney, J. Airships.

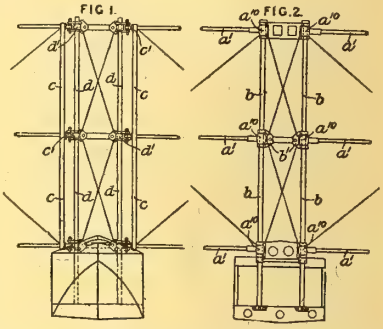
Abridgments of recently published Specifications.

106,794. Toothed Gearing. Royce, F. H., and Rolls-Royce, Ltd., Nightingale Road, Derby.

In toothed reduction gearing for use on aeroplanes, with turbines, etc., a toothed wheel 2 is formed on or secured to a hollow shaft 3 which is connected to the engine crank or other driving shaft 9 by a universal joint comprising a spherical bush 4 and toothed inter-engaging parts 7,8. The wheel 2 gears with a toothed wheel on the shaft 14 driving the propeller, etc. Shafts 3, 14 are both carried in adjustable roller bearings. To ensure exact alignment of the shafts 9, 3, the bearing of the shaft 3 is adjusted by radial screws 12 until a gauge-piece 11 can be freely inserted between the shaft 3 and an extension 5 of the shaft 9. The shaft 14 is adjusted by the use of eccentric bearing-housings 15, 17 provided with serrations 16, 18 so marked that the housings may be equally rotated. The housing 15 may be locked by a serrated ring 19 and retained by a nut 20; a serrated nut 21 engages the housing 17, a locking-plate 22 being provided.

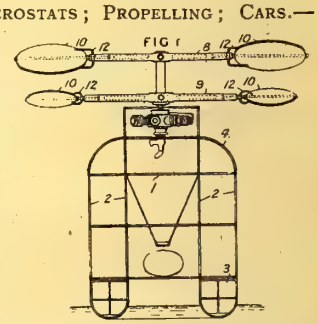


106,818. Aeronautics. Levy, L. G., 19, Avenue de la Grande-Armee, Paris. Not yet accepted. Abridged as open to inspection under Sect. 91 of the Act. (Class 4.)



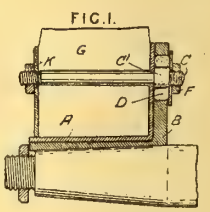
Planes, arrangement of.—Multiplane aeroplanes and hydro-aeroplanes having planes adapted to be turned back about a rear vertical strut for transport have auxiliary front struts on the movable portions adapted to engage corresponding fixed struts when in operative position. Figs. 1 and 2 show portions of a triplane in which the rear spars a^1 of the wings have sleeves a^{10} pivoted about uprights b and between forked brackets b^1 braced as shown. The front inner ends of the planes are connected by uprights c having eyes c^1 adapted to be pinned to shackles d^1 on uprights d on the car or hull. The planes are stayed by wires to a single turnbuckle-fitting arranged transversely at the forward part of the hull. The wires for controlling the ailerons may be led around pulleys just behind the uprights b, so that the wires need not be disconnected when the wings are folded.

106,888. Aeronautics. Porter, J. R., 9, Gray's Inn Square, London.



Aerial Machines without Aerostats; Propelling; Cars.—A helicopter is supported by two oppositely rotating propellers 8, 9, the propeller 9 being mounted upon an annular wheel, and the propeller 8 upon a part carrying the planet wheels of an epicyclic gear of which the sun pinion is driven by the engine. The propellers have each four arms provided with blades 10 which may pivot about their centres of pressure within the limits of stops 12 so as to assume an angle for helical gliding should the engine stop. When circular blades are used they may be fixed on the arms. The upper propeller is larger than the lower one. The machine is supported upon a light frame 1, 2 having an annular float 3 and a suspended seat 4. Horizontal motion is induced by a weight sliding on a rod.

106,944. Screw-propellers. Bradshaw, G. E., A.B.C. Works, Hersham, Walton-on-Thames, Surrey.



The wooden blade G is secured to an intermediate loose boss A by means of a bolt C, the head C^1 of which is deeper than the fixed boss B and is surrounded by a resilient buffer D of sufficient thickness to prevent the stresses, when the nuts F, K are screwed up, from falling on the boss B.

A USEFUL HAND-BOOK.

The management of A. V. Roe and Co., Ltd., have published the second edition of a book produced in 1915 called "Erecting and Aligning 80 h.p. Avro Biplanes, Type 504."

Although this book deals specifically with the adjustment of this particular machine, the system set forth may, of course, be employed with any normal type of tractor biplane, and it is, therefore, of very general interest.

The volume has been entirely re-written, to bring it in line with up-to-date knowledge, and there will doubtless be a considerable demand for copies, not only from those engaged in the Flying Services, but from those in the Aircraft Industry, who are anxious to learn something of their craft.

Ease of reference has been kept in view throughout; accordingly, the book has been divided into seven stages, each stage being taken in its order. The stages are each divided into sec-

tions, describing the adjustment of the machine in front view, side view, and plan view, and each section is again sub-divided under "Enunciation," "Method," "Check," and "Appliances."

Under "Enunciation," is the adjustment required to be done.

Under "Method," is the method of obtaining this adjustment.

Under "Check," a suitable measurement is given, when possible, to be used as a check on the true adjustment.

Under "Appliances" is a description of any appliances required when aligning the machine.

In addition, the book contains some most useful tables, including tables of combination strength, showing the sizes of turnbuckles, shackles, etc., which are properly used with the different Admiralty, R.A.F., Bullivant, Brunton, and Cradock cables.

The whole booklet is illustrated with clear and well-drawn diagrams, and the best tribute that can be paid to its usefulness is to say that one wished that such a work existed in connection with every type of aeroplane in use.

The price of 1s. 6d., which is all that is charged for the book, is purely nominal when its value is considered.

Applications for copies should be addressed to A. V. Roe and Co., Ltd, Newton Heath, Manchester.

PISTON RINGS AND OBTURATORS.

A correspondent writes:—

In quite a recent book on "Aeronautical Engines," a statement was made which, in view of recent developments, should not remain unchallenged.

The author of the book may not be alone in the opinion he expresses, namely, that the friction loss due to obturators is excessive, and greater than that due to piston rings; but it is not based on any tests, and no reasons were given therefor. A superficial consideration of the subject might lead one to the conclusion that the friction was enormous, as the obturator is pressed by the force of the explosion against the walls of the cylinder. While the latter is perfectly true, although this pressure can be regulated, a further consideration will show that in spite of this pressure the friction losses are not high.

Firstly, the obturator is only subject to pressure during a small portion of the cycle; and, secondly, during this portion of the cycle the piston movement is small. Hence, from theoretical considerations it would be anticipated that the friction loss of one obturator is negligible as compared with several piston rings, which have to exert a considerable pressure per square inch for the whole of the cycle.

That the aforesaid statements are correct is absolutely proved by the insignificant wear of an obturator ring, even though made of relatively soft material.

MARKET REPORTS.

Prices given are for quantities on usual terms.

August 8th, 1917.

COPPER.—Owing to August Holidays, no current prices are available, and there has not been any change reported. The situation in U.S.A. is still far from satisfactory, and it is only the fact that colossal stocks are held by refiners, which has kept prices at moderate level. As stated previously, it is the unanimous opinion of eminent authorities that the closing of the only free market in the world has given the American firms the whip-hand. There does not appear to be any reason whatever why certain restrictions should not be removed, there are ample supplies of Copper, and if the Government would only relax their hand the situation might be saved.

Comparative Prices.

Standard Copper, August 10th, 1917	£125	Cash.
,, August 3rd, 1917	£125	Cash.
,, July 3rd, 1917.....	£130	Cash.
,, Two years ago	£72 10s.	Cash.
Copper Sheets	£160	per ton.
Copper Tubes S.D.	19¾d.	per lb.
Brass Sheets 24 Gauge	15⅞d.	per lb.
Brass Tubes S.D.	16½d.	per lb.

TIN.—The market is very firm, and business has been more brisk, as anticipated in our previous reports, American buyers are coming into the market, and the demand from this quarter is bound to increase. Commencing September 1st next, Smelters' terms will be nett instead of less 2½ per cent. as heretofore.

The Ministry of Munitions have imposed further restrictions upon tinplate firms, maximum basis prices for tinplates and terne plates having been fixed; this has disorganised business a little, furthermore, in April, unrestricted sale of certain sizes was permitted, but stocks now held can, until August 31st, be sold for Home trade only, after that date the concession is withdrawn.

Comparative Prices.

August 10th, 1917	£247	0	0
August 3rd, 1917	£247	0	0
July, 1917	£242	15	0
July, 1915	£136	15	0
Highest Price, 1916	£205	0	0

LEAD.—Official Prices are still unaltered, and supplies for national needs are quite adequate. It is expected that the U.S.A. Government will take action in regard to prices there, and, in consequence, business is dull.

Comparative Average Prices.

August 10th, 1917	£30	0	0	(Official).
Last Year	£28	2	6	,,
1915	£23	12	0	,,
Highest Price, 1916	£36	10	0	,,

STEEL.—A great many firms are closed this week, the long holiday being required chiefly by firms to enable them to have a careful stocktaking, so that they can comply with the increasing Government regulations. It is now practically impossible for supplies to be obtained for any other purpose than direct War Work. We understand that the Ministry have issued further instructions to Steel Makers, and it is not surprising to learn that they are framed in such a way that the firms find it impossible to conform to them.

The recent regulations will nearly put an end to merchants and stock-holders, for while large factories invariably dealt direct with the mills, the small firms with orders for small quantities of assorted sizes usually dealt with the merchants. One considers it is false economy to insist upon makers accepting such trifling orders direct. Why not allow the stockholders to put through their orders for large quantities of the sizes for which they have comparatively small but invariably urgent demands? The small consumer, and, occasionally, large factories, with urgent demands, would be assisted and an economy in production effected.

Tremendous efforts are still in progress for a colossal increase in the output of all classes of Steels, and the results, when the mills closed down for holidays was fairly gratifying. Prices remain unaltered.

Current Average Prices.

R.A.F. 3B Steel (Black or Blued Reeled), 36s. to 40s. per cwt.
R.A.F. 1E Steel (Black or Blued Reeled), 78s. to 80s. Basis.
R.A.F. 9A Sheet Steel, 30s. to 32s. per cwt.

ALUMINIUM.—The position remains unaltered.

Official Prices.

Ingot	£225 per ton.
Re-melted	£210 per ton.

TIMBER.—The question of Timber supplies is still very serious, and remains unsolved.

Further to the comments in last week's report on the Admiralty timber stocks, one gives below a few interesting questions which were recently asked in the House of Commons:—

Sir H. Dalziel asked the Minister of Munitions whether he is aware that large manufacturers of aeroplanes in Great Britain absolutely refuse to use any of the Government's stock of silver spruce on the ground that it is for the most part rubbish; whether he is aware that only a few days ago a parcel of silver spruce from Government stocks was examined by the foreman of a big Midland aeroplane builder, of which only 20 per cent. was found suitable, and the balance was returned; and can he say who is responsible for passing inferior wood?

Sir W. Evans: The answer to the first part of the question is in the negative. It is true that a large proportion of a parcel of silver spruce from Government stock was found unsuitable, and that the balance was returned. This was due to the fact that the timber was dispatched before the present system of inspection was instituted.

Sir H. Dalziel: Who was responsible for passing it?

Sir W. Evans: I will inquire.

Mr. Shirley Benn: Was the order given by the Ministry of Munitions, the Admiralty, or Mr. Meyer?

Sir W. Evans: I will have inquiries made.

Mr. Watt: Did not the hon. gentleman say that this was in excellent condition?

Sir W. Evans: I must refer the hon. member to my answer.

Mahogany is becoming increasingly difficult to procure, and the price is stiffening.

Walnut is practically unprocurable.

Current Average Prices.

Silver Spruce, 17s. 6d., c.f.
English Ash, 13s. 6d. to 15s., c.f.
Walnut, 2s. 3d. to 2s. 6d., s.f.
Mahogany, 2s. 2d. to 2s. 4d., s.f.

FABRIC.—There are good supplies of Fabric and Tapes. In view of the uncertainty of the official prices we give below the prices quoted by the Mills.

17C Fabric 36 in. wide	2s. 5½d. per yard.
17C Fabric 38 in. wide	2s. 7d. per yard.
17C Fabric 42 in. wide	2s. 10¼d. per yard.
17C Fabric 54 in. wide	3s. 8¼d. per yard.
Spaced Fabric 37½ in. wide	1s. 7⅛d. per yard.

(*Continued from page* 438B)

our artillery. Many photographs were taken by us, and four hostile aerodromes were heavily bombed during the day.

Enemy aircraft were again particularly aggressive. In air fighting nine German aeroplanes were brought down, two of which fell within our lines, and eight other hostile machines were driven down out of control.

Seven of our machines are missing.

* * *

WAR OFFICE COMMUNIQUÉ.

AUGUST 10th.—The G.O.C. the British Forces in Macedonia reports:—

On the night of August 4th-5th the aerodrome at Livanovo (in the Upper Struma Valley, north-east of Petritch) was successfully bombed by our aeroplanes.

* * *

HOME COMMAND COMMUNIQUÉS.

AUGUST 12th, 7.20 p.m.—At about 5.15 p.m. this afternoon a squadron of about 20 enemy aeroplanes were reported off Felixstowe.

They skirted the coast to Clacton, where they apparently divided, part going south towards Margate.

The remainder crossed the coast and went south-west towards Wickford (a village 8 miles south-south-east of Chelmsford), near which place they turned south-east, and dropped bombs in the neighbourhood of Southend.

Some bombs were also dropped at Margate.

No reports of damage or casualties have yet been received.

Our own aircraft were very quickly in the air and pursued the enemy out to sea.

11 p.m.—The enemy raiders did considerable damage at Southend, where they dropped about 40 bombs.

The casualties so far reported are: Killed, 8 men, 9 women, 6 children; and about 50 people injured.

At Rochford (three miles north of Southend) two men were injured, but no damage so far reported.

At Margate four bombs were dropped, and one uninhabited house was demolished, but no casualties occurred.

THE CASUALTY LIST.

Reported August 8th.

KILLED.—Fitzgerald, Sec. Lt. W. W., R.F.C.
Lovell, Sec. Lt. W. L., R.W. Kent R., attd. R.F.C.
Rayner, Sec. Lt. N. R., W. Yorks. R., attd. R.F.C.
Rodocanachi, Sec. Lt. P. J., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Severs, Sec. Lt. A. G., R.F.C.
Sharpe, Sec. Lt. M., R.F.C.
Thomas, Lt. M. W., R.F.A., attd. R.F.C.
Topham, Sec. Lt. M., R.F.C.

DIED OF WOUNDS.—Hope, Sec. Lt. H. A., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED OF WOUNDS.—Lowery, Capt. A. M., R.F.C.
Swann, Lt. G. W., A.S.C., attd. R.F.C.

WOUNDED.—Blencowe, Sec. Lt. F. P., S. Staff. R., attd. R.F.C.
Britton, Lt. A. F., M.G.C., attd. R.F.C.
Burkett, Sec. Lt. G. T. W., R.F.C.
Cassels, Sec. Lt. J. S., M.C., R. Suss. R., attd. R.F.C.
Clayton, Sec. Lt. O., R.F.C.
Cresswell, Sec. Lt. H., R.F.C.
Foden, Sec. Lt. J. C., R.F.C.
Hughes-Chamberlain, Lt. J. L. M. de C., Suff. R., attd. R.F.C.
Kennard, Sec. Lt. W. D., Lond. R. and R.F.C.
Lewis, Sec. Lt. T. A. M. S., R.F.C.
Luke, Sec. Lt. T. C., M.C., R.E., attd. R.F.C.
Marsden, Sec. Lt. C. C., R.F.C.
Roy, Sec. Lt. H. St. C., M.C., R. Innis. Fus., attd. R.F.C.
Turner, Sec. Lt. A. E., M.C., R. War. R., attd. R.F.C.
Watt, Sec. Lt. N. L., Cav. Spec. Res., attd. R.F.C.
Willis, Sec. Lt. G. R., S. Lan., attd. R.F.C.

MISSING.—Beatty, Sec. Lt. B. C., R.F.C.
Campbell, Sec. Lt. J. K., R.F.C.
Chapman, Sec. Lt. J., High. L.I., attd. R.F.C.
Hine, Sec. Lt. J. B., R.F.C.
Hume, Sec. Lt. R. C., R.F.C.
McPherson, Sec. Lt. L. A., R.F.C.
Ottey, Sec. Lt. R. G., Leic. R., attd. R.F.C.
Roskelly, Lt. W. M., R.F.C.
Smith, Sec. Lt. J. C., R. War. R., attd. R.F.C.
Walker, Lt. G. H., S. Lan. R., attd. R.F.C.
Wilkins, Capt. H. O. D., Bedf. R., attd. R.F.C.
White, Sec. Lt. T. W., R.F.C.

Reported August 9th.

KILLED.—Conran, Maj. O. M., R. Lanc. R., attd. R.F.C.
Mitton, Lt. H., R.F.A., attd. R.F.C.
Pizey, Lt. N. M., Yeo. and R.F.C.

DIED OF WOUNDS.—Airth, Lt. R. A., Bedf. R., attd. R.F.C.

WOUNDED.—Goldie, Sec. Lt. G. N., R.F.C.
McCall, Lt. M., R. Scots Fus. and R.F.C.

MISSING.—Corbishley, Sec. Lt. R. H., Devon R., attd. R.F.C.
Gunner, Sec. Lt. W. H., M.C., R.F.C.
McDonald, Lt. H. O., R.F.C.
Minot, Capt. L., R.F.C.
Rickards, Lt. H. W. B., R.F.A., attd. R.F.C.

PREVIOUSLY REPORTED PRISONER, NOW REPORTED WOUNDED AND PRISONER IN GERMAN HANDS.—Furniss, Sec. Lt. K. R., Yeo. and R.F.C.

CORRECTION.—Bond, Lt. W. A., M.C., K.O.Y.L.I., attd. R.F.C. (reported missing), should read—Bond, Capt. W. A., M.C., K.O.Y.L.I., attd. R.F.C.

CANADIAN CONTINGENT.—MISSING.—MacKay, Lt. W. B., Cent. Ont. Regt., attd. R.F.C.

PREVIOUSLY REPORTED KILLED, NOW REPORTED DIED AS PRISONER IN GERMAN HANDS.—Masson, Lt. R. G., E. Ont. Regt., attd. R.F.C.

Reported August 10th.

KILLED.—Walker, Lt. S. R. P., R. W. Surr. R., attd. R.F.C.

DIED OF WOUNDS.—Smith, Capt. G. C., M.C., A.S.C., attd. R.F.C.

WOUNDED.—Collier, Sec. Lt., Som. L.I., attd. R.F.C.
Gordon, Sec. Lt. A. W., R.F.C.
Harrison, Sec. Lt. C. J. L., Worc. R. and R.F.C.
Lascelles, Capt. G. A., R.F.C.
Roberts, Lt. V. C., Northd. Fus., attd. R.F.C.
Snowden, Lt. H. J., S. Lan. R., attd. R.F.C.

MISSING.—Best, Lt. F. B., A.S.C. and R.F.C.
Buxton, Sec. Lt. G. B., Norf. R. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Bacon, Sec. Lt. L. G., R.F.C.
Spearpoint, Sec. Lt. H. G., R.F.C.

Reported August 11th.

DIED OF WOUNDS.—O'Beirne, Sec. Lt. A. J. L., Yeo. and R.F.C.

WOUNDED.—Budgen, Sec. Lt. H. K., S. Wales Bord., attd. R.F.C.
Coningham, Capt. A., R.F.C.
James, Lt. H. H., Manch. R., attd. R.F.C.
Tayler, Sec. Lt. St. C. C., R. Suss. R., attd. R.F.C.
Woodbridge, Sec. Lt. A. E., R.F.C.

MISSING.—Carson, Sec. Lt. T. L., R.F.C.
Kellog, Sec. Lt. W. B., R.F.C.
Leete, Sec. Lt. S. J., Worc. R. and R.F.C.
Longton, Lt. J., A.S.C., attd. R.F.C.
Nickalls, Lt. H. G., Yeo. and R.F.C.
Watt, Sec. Lt. W. H., Ches. R., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Durkin, Sec. Lt. F. V., Worc. R. and R.F.C.

Reported August 13th.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Mills, Lt. W. L., R.F.A., attd. R.F.C.

DIED.—Crerar, Sec. Lt. M. C., R.F.A., attd. R.F.C.

WOUNDED.—Campbell, Capt. W. C., D.S.O., M.C., R.F.C.
Earwaker, Sec. Lt. R. N. D'O., Manch. R. and R.F.C.
Howes, Sec. Lt. W. H., R.F.C.
Irwin, Sec. Lt. A. C. S., R. Ir. Rif., attd. R.F.C.

MISSING.—Beldam, Lt. C. H., Camb. R. and R.F.C.
Skeffington, Sec. Lt. H. N. S., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED WOUNDED AND PRISONERS IN GERMAN HANDS.—Smith, Lt. V., North'd Fus., attd. R.F.C.
Stewart, Sec. Lt. J. D. M., R.F.C.

PREVIOUSLY REPORTED PRISONERS OF WAR, NOW REPORTED WOUNDED AND PRISONERS IN GERMAN HANDS.—Crisp, Sec. Lt. A. E., Norf. R. and R.F.C.
Gilchrist, Sec. Lt. W., Rif. Brig., attd. R.F.C.
Holman, Sec. Lt. L., Hussars, attd. R.F.C.
Illingworth, Sec. Lt. F. W., Sco. Rif., attd. R.F.C.

AUSTRALIAN FORCE.—ACCIDENTALLY KILLED.—Trout, Lt. R. C., F.C.

WOUNDED.—Taylor, Sec. Lt. H. F., F.C.

PREVIOUSLY REPORTED MISSING, RELIEVED KILLED, NOW REPORTED DIED OF WOUNDS AS PRISONER IN TURKISH HANDS.—Steele, Sec. Lt. N. L., F.C.

CANADIAN CONTINGENT.—KILLED.—Dracup, Lt. G. F., Cent. Ont. R., attd. R.F.C.

ACCIDENTALLY KILLED.—Michener, Lt. L., Engrs., attd. R.F.C.

MISSING.—Malloch, Lt. C., E. Ont. Regt., attd. R.F.C.

* * *

CASUALTIES AMONG WARRANT OFFICERS, N.C.O's, AND MEN OF THE R.F.C. The dates are those of the official list:—

WOUNDED.

JULY 30th.—R.F.C.—Clementson 55001 3rd Cl. Air Mech. P. (Liverpool); Newman 56359 2nd Cl. Air Mech. M. G. (Pecham, S.E.).

R.F.C., attached R.G.A.—Blackwell 10585 2nd Cl. Air Mech. R. (Gloucester).

JULY 31st.—R.F.C.—Badham 21958 2nd Cl. Air Mech. A. (Huddersfield); Boniface 18734 1st Cl. Air Mech. A. G. (Wimbledon Park, S.W.); Broomfield 34311 2nd Cl. Air Mech. F. G.

(Aldershot); Carver 24600 2nd Cl. Air Mech. A. J. (Withington); Davies 22896 2nd Cl. Air Mech. E. B. (Llandinam); Luff 30625 Cpl. A. E. (Tiddington); Newton 22684 1st Cl. Air Mech. C. (Gunnersbury, W.); Pearce 21161 2nd Cl. Air Mech C. (Southampton); Reeve 20196 2nd Cl. Air Mech. E. C. (Woking).

AUGUST 1st.—R.F.C.—Carr 1198 1st Cl. Air Mech. F. W. (Hindhead).

AUGUST 2nd.—R.F.C.—Logette 75771 3rd Cl. Air Mech. M. (Caterham Asylum).

R.F.C., attached R.G.A.—Jancey 9569 1st Cl. Air Mech. W. (Teddington); Purchase 44252 2nd Cl. Air Mech. W. H. (Clapham Park, S.W.).

AUGUST 3rd.—R.F.C.—East 44230 2nd Cl. Air Mech. S. S. (Moreton Hampstead); Godfrey 51843 2nd Cl. Air Mech. P. L. (Norwich); Powling 8995 Flt. Sgt. C. (Peckham, S.E.); Swindells 57184 3rd Cl. Air Mech. H. (Edgeley).

MISSING.

JULY 31st.—R.F.C.—Gilchrist 4567 2nd Cl. Air Mech. E. (White Abbey).

K.R.R.C., attached R.F.C.—Edwards 4937 G. A. (Walthamstow, E.).

AUGUST 1st.—R.F.C.—Backhouse 63004 Sgt. D. (Ramsgate).

The following are reported Prisoners of War in lists received from the German Government :—

AUGUST 2nd.—R.F.C.—Loughlin 39972 2nd Cl. Air Mech. J. W. (Widnes); R.F.C.—Wait 78419 Sgt. T. E. (Cwmnbran).

AUGUST 4th.—R.F.C.—Lewis 78492 Sgt. G. (Birmingham).

THE BLACK WATCH, attached R.F.C.—Sturrock 1888 L.-Cpl. C. (Forfar).

PERSONAL NOTICES.

DEATHS.

ANTHONY.—Capt. J. R. Anthony, R.F.C., was reported prisoner of war some time ago, and news was recently received that he had died of wounds. He was the son of the late Alderman Anthony, of Pwllheli. Capt. Anthony was wounded while attacking Germans, who were in superior numbers. He showed supreme gallantry in air fighting. Before the war he was a solicitor at Pwllheli.

BAILEY.—Sec. Lt. Clive Maxwell Bailey, R.F.C., who was killed while flying on August 3rd, was the elder son of Mr. Reginald Bailey, of Barton Hatch, Limpsfield, Surrey, and was aged 23. He was an undergraduate of Caius College, Cambridge, and before joining the Flying Corps he had served with the Royal Fusiliers at the front as a bomber, having enlisted in the Universities' and Public Schools' Battalion of that Regiment.

CONRAN.—Major Owen Mostyn Conran, King's Own Royal Lancaster Regt., attached R.F.C., who was killed in France on the night of July 28th when on bombing duty, was the youngest son of the late Major Conran, Essex Regt., and of Mrs. Conran, of Brondyffryn, Denbigh. He was born on April 1st, 1881, was **educated at Shrewsbury, served in the South African War, and joined the Royal Lancaster Regt. from the South Lancashire Militia in 1901.**

He was promoted Captain in July, 1907, and on July 29th, 1913, was seconded for service with the Egyptian Army, becoming **Major in September, 1915. At the outbreak of war he saw active service in Egypt and the Sudan, and did a considerable amount** of flying. In July, 1916, he was sent to England on sick leave, **during which he obtained permission to become attached to the R.F.C.**

In November, 1916, he was made Flt. Commander, and in April, 1917, he went to France. The following is quoted from letters announcing his death :—"He is a very great loss to me, and will be missed by everyone, officers and men alike, throughout the squadron." "He had just completed with great courage and success a most difficult and dangerous task."

CUTLER.—Capt. Stuart Le Geyt Cutler, A.S.C., attached R.F.C., who was killed in action on July 9th, was the only son of Major J. F. Cutler and Mrs. Cutler, of Jersey. He was 23 years of age.

HOLMES.—Lt. Thomas George Holmes, R.F.C., who was previously reported missing, and is now believed to have been killed in action on the night of the 6th-7th May, 1917, was the eldest son of Mr. and Mrs. T. B. Holmes, Petridge Wood, near Redhill. He was 24 years of age.

MOORCROFT.—1st A.M. Frederick John Moorcroft, R.F.C., who was killed on active service on August 8th, was the youngest son of R. K. and A. L. Moorcroft, Mill Road, Epsom. He was 20 years of age.

PAGET.—Lt. Gerald L. Paget, Northumberland Fusiliers, attached Australian Flying Corps, who was killed in an air fight on July 13th, was the youngest son of the late Arthur Paget and of Mrs. Arthur Paget, and husband of Winifred Paget. He was 23 years of age.

PIZEY.—Sec. Lt. Noel Martin Pizey, Yeomanry, attached R.F.C., who died on July 27th of wounds received the same day, was the elder son of the late John Martin Pizey and Mrs. Pizey, of Cothamside, Bristol. He enlisted as a trooper in the Yeomanry in 1914, and later joined the Inns of Court O.T.C., receiving his commission in December, 1915. He was sent to France in November 1916, and attached to the R.F.C. a few months later. He met his death during a fight between five British machines and 20 of the latest type of enemy machines, seven of which were brought down, while all the British regained their lines.

SHARPE.—Sec. Lt. Maurice Sharpe, R.F.C., after having been reported missing, is now officially reported killed in action. He was the youngest son of Sir Alfred Sharpe, C.B., K.C.M.G., and of Lady Sharpe, of Elmhurst, Lancaster. Educated at Rugby, he had a business training with Messrs. Storey Bros., Lancaster. He took part in the campaign in the Cameroon, and afterwards obtained a commission in the R.F.C. He was 29 years of age. He was a keen Rugby forward, and excelled in rowing, hockey, and motoring. He is the seventh Rugby forward of the Vale of Lune Club who has been killed in action. Ten of the playing members of the club have fallen in the war.

SHIRLEY.—Archibald Vincent Shirley, Yeomanry, attached R.F.C., who was killed on June 8th in an air fight, was the only surviving son of Walter P. Shirley, Leckwith, Cardiff, and grandson of the late Mr. Archibald Hood.

SNOWDEN.—Lt. Harold Jackson Snowden, South Lancashire Regt., attached R.F.C., who died on August 11th of wounds received in action on July 31st, was the youngest son of the late Joseph Snowden, and of Mrs. Snowden, The Chantry, Stanmore. He was 20 years of age. Funeral Service took place at St. James's, West Hampstead, on August 15th, at 2.30, and afterwards at West Hampstead Cemetery

SWORDER.—Killed in action, on April 2nd, Lt. Hubert Pelham Sworder, the Queen's Regt., attached R.F.C., who was killed in action on April 2nd, was the younger son of Mr. and Mrs. John Sworder, of Barkway, Herts. He was 19 years of age.

TATE and PETTIGREW.—Lt. William Edward Tate and Lt. Gilbert Thomas Richardson Pettigrew, both attached R.F.C., were killed in an aeroplane accident in North Wales on August 12th.

TAYLOR.—At an inquest on August 11th concerning the death of Lt. William Alexander Taylor, R.F.C., who was instantly killed on the previous day as the result of a fall from a height of 3,000 ft. near Rugby, it was stated by Capt. Kenneth Leask (Flight Commander) that Mr. Taylor was evidently about to loop at the time of the accident. His machine suddenly went up vertically at a great speed, but the left wing collapsed and the aeroplane fell with a spinning nose-dive. The witness had flown the machine on the previous evening, and it was in perfect order.

Probably Mr. Taylor pulled the control back too hard, causing such a strain that the left wing collapsed. A verdict of accidental death was returned. The deceased officer was the son of Mr. William Taylor, of Mary Hill Park, Glasgow. He had for some time been an observer in France.

WALLER.—At Hounslow on August 11th an inquest was held on Sec. Lt. C. R. Waller, R.F.C., whose home is at Meopham, Kent.

The evidence showed that on August 9th Mr. Waller was sent up for an altitude test, and he had reached 16,000 ft. when the machine nose-dived, righted itself, then dived again and rolled over. An explosion occurred, and the machine was blown to pieces, the aviator being picked up in a hedge dead.

Capt. C. P. Inglefield said that the machine was in sound condition. Mr. Waller had never before flown more than 3,000 ft. up and it was very unusual and dangerous to fly 16,000 at a first attempt. He thought that the officer must have become faint, or had a heart attack, for his flying cap, which was strapped under his chin before he went up, was found unstrapped two miles away, and one of the first things a flying man did if he felt faint was to unloose the strap. The pressure of air at such a height might have caused faintness. It would be useful to have an air pressure gauge on the machines. [Is not an aneroid a pressure gauge?.—Ed.]

The jury returned a verdict of "Accidental death."

Mr. Waller, who was 19 years of age, was the son of Bishop and Mrs. Waller, of Tinnevelly, India.

VALENTINE.—It is with deep regret that one records the death of Major James Valentine, D.S.O., R.F.C. A brief message from Russia states that he died in Kieff after an operation. The cause of the operation is at the moment unknown.

James Valentine was born in London on August 22nd, 1887. In his early days he was concerned in the motor industry, and was known as one of the most daring and skilful drivers on the road, though he never drove in any of the big races. When flying began he naturally gravitated towards the new form of locomotion, and in 1910 began to take an active part therein. He acquired a Gnôme engine and joined forces with Mr. R. F. Macfie at Brooklands, the resulting Macfie biplane being an excellent example of its period. On this machine James Valentine and Robert Macfie took their certificates, the former's ticket being No. 47, dated December 31st, 1910.

Soon afterwards James Valentine went to Paris, where he was taken on as a pilot by the Deperdussin firm, then making a great name for itself, and he suddenly acquired popular fame by his admirable performance in the "European Circuit" of 1911. He was one of the few pilots, and the only British competitor, to complete the course, which ran from Paris to Reims, Utrecht, Amsterdam, Brussels, Calais, Shoreham, Hendon, and back to Paris. A wonderful journey at the period.

A few weeks later, on the same little Deperdussin monoplane, with a 50-h.p. Gnôme, he started in the "Daily Mail" "Circuit of Britain," and covered the whole course, the only others to finish, out of some 20 odd starters, being Lt. Jean de Conneau ("André Beaumont"), Jules Védrines, and the late Mr. S. F. Cody, in that order. These performances stamped James Valentine as a pilot of the first class, and after a little exhibition flying, including some wonderfully skilful work at Shanklin, Isle of Wight, he joined the Bristol Co., and flew one of the Coanda-Bristol monoplanes in the Military Trials on Salisbury Plain in the autumn of 1912.

Thereafter he devoted most of his time to the motor trade, as aviation during the almost stagnant period of 1913-14 could hardly provide a living for its devotees, but he flew occasionally, and always with consummate skill and judgment. During this time he became a partner in the firm of Valentine and Robertson, now Robertson and Co., of Albemarle Street.

On the outbreak of war he joined the R.F.C., and flew on active service. His flight from Milan to Paris on a big Caproni biplane was a fine performance. Previously he had been appointed to oversee the acquisition of aircraft matériel by the R.F.C. from the French Aircraft Industry, for which work his intimate knowledge of the motor trade and of the early aircraft firms in both countries particularly qualified him. His success in promoting cordial relations between the parties concerned was rewarded by the French Government with his appointment to the Legion of Honour.

At a later date he was attached to the Russian Commission of the Comité de Ravitaillement, and, in this connection, he was sent on a special mission to Russia, with the rank of Major, R.F.C. Quite recently, his services during the war were rewarded by his appointment to the Distinguished Service Order.

In 1914, James Valentine married Eileen, daughter of the late Major-General Charles Knox, C.B., late Scots Guards, and of Lady Sybil Knox, sister of the present Lord Lonsdale, and all will offer their deepest sympathy to his young widow.

Many of the old hands among motorists and aviators will mourn the death of one of the pioneers of both sports, for Jimmy Valentine, as he was generally called, had won personal popularity to a high degree. He possessed singular charm of manner and an engaging smile, which somehow proved irresistible, even when one felt that one ought to be annoyed with him for some wild feat such as the youthful sportsman of the pre-war period affected. His good temper and his cheery *nonchalance* carried him through many a difficult position, and won him friends wherever he went. Even those who best knew his faults liked him personally none the less, and of all the friends one has lost in the war, few will be more missed than Jimmy Valentine.—C. G. G.

An old friend of Major Valentine's writes:—

"It is strange to think that James Valentine is dead, he who had so much of the joy of life.

"I knew him first in 1909 at Brooklands, in the days when motor racing by amateurs was most prominent in the annual programme. He drove a touring La Buire, stripped of all encumbrances, and also, it must be admitted, stripped of all beauty as well. His success in racing was limited, but his popularity was great. Nothing seemed ever to disturb the high serenity of his spirits. Gloom, if he ever fell beneath its veil, came only in the twilight hours when none was by to see.

"Later we drifted apart. But from time to time we met, and on earth a greater incongruity than the association of Jimmy Valentine with his vivid driving and the old Georgian mansion sleeping nobly in a wooded park where his Fates had led him for a temporary residence! Here, too, his gaiety overcame the disapproval not unnaturally brought into being by the vehemence of his passage over the country roads.

"Later we drifted apart. But from time to time we met, and all was as if no interruption had been. He learned to fly with the same erratic method of life that gave him personality. He flew well when he cared to make the effort. But his very enthusiasm, uncoupled as it was with perseverance, prevented any continuity of purpose and consequently he did not leave any abiding impression on the flying of his day.

"And now he has left the troubles of this world. The abiding memory of 'Jimmy' Valentine will be of a lovable personality, who, with all his faults, was a joyous figure in life, who gave happiness to many, and who, in his day, had something of that generosity of mind which is the rarest of all human attributes.—W."

Engagements.

LOVEMORE—GOULD.—An engagement is announced between Mr. Norman B. Lovemore, R.F.C., youngest son of Mr. W. B. Lovemore, of Mbabane, Swaziland, South Africa, and Nowell, only daughter of Mr. Lionel F. Gould, of The Gable House, Bilton, Rugby.

PATTERSON—FOTHERINGHAM.—The marriage between Lt. Robert Wilson Patterson, R.F.C., late R.E., second son of Mr. and Mrs. Patterson, 32, Westbourne Gardens, Glasgow, and Mabel, youngest daughter of Dr. and Mrs. Fotheringham, of Rosshill, Motherwell, and Largo, Fife, will take place quietly at Largo on Thursday, August 23rd.

ROWDEN—JOBSON.—An engagement has been announced between Capt. C. R. Rowden, M.C., Worcestershire Regt. and R.F.C., only son of A. R. Rowden, of Hillend, Eastnor, Ledbury, and Frances, elder daughter of Mrs. Jobson, Millcroft, Rottingdean, Sussex.

SHINGLETON—BARCHARD.—The engagement is announced between Lt. Frank Shingleton, A.S.C., attached R.F.C., second son of Mr. and Mrs. Frederick Shingleton, 67, Cornwall Gardens, and Leonor Christin, only daughter of Mr. and Mrs. Harry Barchard, Northrepps, Norfolk.

Marriage.

SMYTH—JONES.—On August 6th, at Murree-Punjab, India, Capt. Geoffrey Meliss Smyth, Loyal North Lancashire Regt., attached R.F.C., only son of Percy Meliss Smyth, 5, Foulis Terrace, Onslow Square, S. W., was married to Helen Millicent (Nellie), third daughter of J. J. C. Jones, C.B., 14, Cumberland Road, Kew Gardens, W., late Chief Commissioner of Metropolitan Police, Dublin.

Births.

GULLIVER-CRADWICK.—On August 9th, at "Windermere," Alverstoke, the wife of Capt. L. Gulliver-Cradwick, R.F.C. —a son.

STALLIBRASS.—On August 10th, at 14, Princes Gate, S.W., the wife of Lt. T. L. W. Stallibrass, R.F.C., of a daughter.

Capt. W. A. Bishop, whose "independent" air offensive against the Huns won him the V.C., is the only Canadian officer who holds, in addition to the V.C., the D.S.O. and the Military Cross. He is only 23 years old, was born at Owen Sound, Ontario, and is a graduate of the Royal Military College, Kingston, Ontario, the Canadian Sandhurst, whence many fine fighting men have come. Capt. Bishop came over with the 7th Canadian Mounted Rifles, but never went to France with them. Soon after reaching England he joined the R.F.C., went to the front in January, 1916, and attained the rank of Flight Commander in April of this year. Up to the end of July Capt. Bishop had brought down no fewer than 36 enemy machines.

* * *

The special correspondent of the "Morning Post," writing of the recent fighting around Glencorse Wood, from British Headquarters in France on August 12th, says:—

Their (the Germans') aeroplanes are fighting again for mastery of the sky, and many thrilling combats have taken place during the past three days.

* * *

The Annual Sports of the R.F.C., stationed at Hounslow, took place on August 6th. The following were the prize-winners:—

440 Yards, flat.—(1) Sgt. Davis, 57 sec.; (2) Sgt. Sharrocks; (3) Air Mech. Stanton.

Throwing the Cricket Ball.—(1) Air Mech. Dann, 108 ft.; (2) Lt. Weller; (3) Cpl. Ault and Air Mech Gale tied.

Long Jump.—(1) Lt. Flower, 16 ft.; (2) Air Mech. Holland; (3) Cpl. Harris and Cpl. Ault tied.

High Jump.—(1) Lt. Norman, 4ft. 11 in.; (2) Cpl. Ault; (3) Air Mech. Armes and Lt. Flower tied.

1 Mile, flat.—(1) Air Mech. Janson, 5 min. 1 sec.; (2) Cpl. Fisher; (3) Air Mech. Cleaver.

100 Yards, flat.—(1) Capt. Collie, 10 sec.; (2) Sgt. Davis; (3) Sgt. Sharrocks.

1 Mile, flat.—(1) Air Mech. Janson, 5 min. 7 sec.; (2) Air Mech. Riley; (3) Cpl. Asker.

4-Legged Race.—(1) Air Mech. Clough's Team; (2) Air Mech. Thompson's Team.

100 Yards Hurdle.—(1) Capt. Collie, 13 2/5 sec.; (2) Air Mech. Gale; (3) Cpl. Ault.

¼ Mile, flat.—(1) Pte. Kidman, A.S.C., 55 3/5 sec.; (2) Cpl. Leadbitter, A.S.C.

Boat Race on Poles (1), 42, H.Q., 26 2/5 sec.; (2) 3 A.R.S.

1 Mile, flat.—(1) Cpl. Pratt, R.F.C., Greenwich, 4 min. 28 2/5 sec.; (2) Air Mech. Gale; (3) Cpl. Asker.

Mop Fight.—(1) Sgt. Martindale and Air Mech. Sweening; (2) Flt. Sgt. Armstrong and Flt. Sgt. Elsby; (3) Air Mech. Crosby and Air Mech. Henderson.

½ Mile, flat.—(1) Air Mech. Janson, 2 min. 20 sec.; (2) Sgt. Davis; (3) Air Mech. Riley.

Tilting the Bucket.—(1) Sgt. Martindale and Air Mech. Sweeney; (2) Air Mech. Livingstone and Air Mech. Owen; (3) Lt. Balfour and Lt. Davis.

Corporals' Race, 100 yards.—(1) Cpl. Ault, 10 4/5 sec.; (2) Cpl. Fisher; (3) Cpl. Harris.

Sergeants' Race, 100 yards.—(1) Sgt. Davis, 10 3/5 sec.; (2) Sgt. Sharrocks; (3) Sgt.-Maj. Richardson.

Officers' Race, 100 yards.—(1) Capt. Collie, 10 2/5 sec.; (2) Lt. Baulder; (3) Lt. McIlwraith.

¼ Mile, flat.—(1) Cpl. Bentley, 55 3/5 sec.; (2) Air Mech. Dann; (3) Air Mech. Gale.

1 Mile, flat.—(1) Pte. Kidman, A.S.C., 4 min. 35 sec.; (2) Cpl. Pratt, R.F.C.; (3) Cpl. Beard.

Tug of War.—(1) A.R.S.; (2) 42 Squadron.

220 Yards.—(1) Sgt. Davis, 25 sec.; (2) Cpl. Bentley; (3) Air Mech. Dann.

Boot Melee.—(1) Air Mech. Stanton; (2) Air Mech. Bartlett; (3) Air Mech. Livingstone.

¼ Mile, flat.—(1) Air Mech. Tutfield, 42 sec.; (2) Air Mech. Pratt; (3) Cpl. Bentley.

Sack Race.—(1) Flt. Sgt. Armstrong; (2) Air Mech. Robson; (3) Air Mech. Bell.

Bumping Melee.—Not completed.

Relay Race.—(1) W.A.R.S.; (2) 19 Squadron Officers.

Pillow Fight.—(1) Air Mech. Stanton; (2) Air Mech. Cleaver; (3) Flt. Sgt. Elsbee.

Obstacle Race.—(1) Lt. McIlwraith; (2) Lt. Balfour; (2) Air Mech. Taylor and Air Mech. Bourne tied.

Band Race.—(1) Boy T. Jones, Middx. Regt.; (2) Pte. Hoar, Royal Fus.; (3) Pte. Paynter, Middx. Regt.

Tug of War.— Police v. R.F.C.—Won by the Police.

Station Championship.—Won by Sgt. Davis.

FRANCE.

Official Communiqués.

August 8th.—Army of the Orient.—British aviators bombarded the enemy camps south of Veles (Serbia).

August 9th.—Yesterday, in spite of the bad weather, which rendered their mission particularly difficult, our air squadrons carried out many raids and bombarded the aviation grounds of Colmar and Habsheim (east-south-east of Mulhouse). All the objectives were hit.

Army of the Orient.—British aviators bombarded with success the aerodrome at Livanovo (Bulgaria, north of Zernovol) and the enemy depots in the region of Seres (Struma front) and in that of Stojakovo (between Lake Dorian and the Vardar).

August 11th.—German aeroplanes last night bombarded the region of Nancy. There were no casualties and the material damage done was very slight.

Two German battle planes were brought down by our pilots on August 10th. Two other machines were badly damaged and forced to come down in their own lines.

Our bombarding aviators effected various operations. The aviation ground of Schlettstadt (north of Colmar) and the barracks of the Forest of Houthulst received several bombs.

Army of the Orient.—The British air service bombarded enemy hangars near Drama.

August 12th.—It is confirmed that a German aeroplane was brought down on August 9th in aerial combat on the Belgian front.

Yesterday an enemy machine was brought down by our machine-gun fire north-east of Vauxaillon (Aisne front).

As a reprisal for the bombardment carried out by the Germans against Nancy and the region north of Paris, two of our aeroplanes, piloted by Lieutenant Mezergues and Sub-Lieutenant Beaumont, bombarded yesterday the town of Frankfurt-on-Main. Both machines returned unharmed.

On the night of the 10th and during the daytime yesterday our aeroplanes bombarded on the Belgian front enemy barracks north of the Forest Houthulst and the railway stations of Cortemarck (east of Dixmude) and Lichterwelde (east of Cortemarck). A fire and violent explosions were observed at Lichterwelde.

The aviation ground at Colmar also received many shells.

August 13th.—During yesterday two German aeroplanes and a captive balloon were brought down by our pilots. Three other enemy machines had to land severely damaged.

Army of the Orient.—British aviators bombarded the enemy airsheds at Xanthi (in Bulgaria, on the Salonika-Constantinople railway), French aviators the region between lakes Malik and Ochrida.

* * *

It was reported from Paris on August 7th that during the month of June French seaplanes carried out 3,139 flights, attacked German submarines on ten occasions, discovered in six cases enemy mine fields, and took part in nine night bombardments on enemy bases. They also carried out some reconnaissances at a considerable distance from their base.

During the same period French naval airships made 141 trips, representing a total of 483 hours in the air.

GERMANY.

Official Communiqués.

August 10th.—Lt. Gontermann shot down two enemy captive balloons.

August 11th.—Nineteen enemy aeroplanes and two captive balloons were shot down, mostly in aerial engagements, which, particularly in Flanders, were very numerous. Vice-Sergt. Muller achieved his 20th and 21st aerial victories.

August 12th.—First-Lt. Ritter von Tutschek brought down his 22nd and 23rd opponents in aerial battle.

August 13th.—One of our aviation squadrons yesterday attacked England. Bombs were dropped with visibly good results on the military works of Southend and Margate, at the mouth of the Thames. One of our aeroplanes is missing.

On the Continent yesterday 14 enemy aviators and one captive balloon were shot down.

In the month of July the losses of our adversaries amounted to 34 captive balloons, and at least 213 aeroplanes, of which 98 were brought down in flames as a result of aerial attack behind our lines and 115 beyond the enemy lines. We have lost 60 aeroplanes but no captive balloons. o

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A telegram from Frankfurt-on-Main, dated August 13th, says: A bomb was dropped by an enemy aviator on August 11th. It killed nobody and wounded a few inmates of a hospital slightly. The aviator dropped five further bombs in a small wood west of Frankfurt without causing any damage. On the following day an enemy aviator again appeared over Frankfurt and dropped several bombs, which fell in crowded streets and killed four people and injured several.

* * *

A message from Paris on August 13th says that a remarkable letter found on a German prisoner throws considerable light on the results obtained in the French raid on Essen last July. The letter is dated July 7th, and the writer states:—

"To-night we have been visited by an enemy air squadron. Shortly before three I was awakened, and anti-aircraft guns began to fire a hundred shots. Our windows shook, factory syrens blew, and bells rang the tocsin. It was terrible. All lamps were put out, everything was in darkness, and people hid in cellars.

"To-day we are still trembling all over. When it became quiet again we went back to bed, but other aeroplanes came, and it all began over again. To-day children are picking up quantities of shells in the streets. Bombs were dropped on the Thyssen factory at Mülheim. The new munition factory in Kruppstrasse has been utterly destroyed (kaput). I cannot give you full details before to-morrow. Bills have been just posted telling us that the raid is to be renewed to-night. No one will go to sleep to-night at Essen. The good God will protect us well. If only we were near the end!"

* * *

A message from Amsterdam on August 9th states that in Baron von Richthofen's memoirs, which have just been published, the German aviator says, speaking of the British aviator:

"He is a dashing fellow. He used to come now and then and pelt Bœlcke's flying ground with bombs; he simply challenged one to battle, and always accepted it. I hardly ever encountered an Englishman who refused battle."

[One assumes, from the fact that his memoirs are published, that Baron von Richthofen was killed, as rumour stated, though no official notification of his death has appeared in this country. —Ed.]

ITALY.

Official Communiqués.

August 8th.—On the 6th inst. and yesterday our bombing flights, notwithstanding heavy anti-aircraft fire, dropped four tons of high explosives on the enemy's military hutments in Chiapovano Valley (north-east of Gorizia), causing great destruction. One of the escorting machines was hit by enemy fire, but succeeded in landing within our lines. All the other machines returned safely to their bases.

August 9th.—In the morning our flights, persevering in the operation begun on the 6th inst. raided Chiapovano Valley (north-east of Gorizia) causing, by dropping numerous bombs, new destruction and fires in the military establishments of this locality. The heavy defensive fire reached the machines and hit some of them, but our gallant aviators were able to bring them all back to their bases.

August 10th.—On the night of August 8th-9th some large flights of our bombing aeroplanes renewed the attack on the military establishment of Pola. Favoured by a good light, our aviators effectively bombed the arsenal and the enemy fleet at anchor, which was clearly visible, by dropping eight tons of high explosives on them. After having escaped the heavy anti-aircraft fire and repulsed the enemy seaplanes risen to oppose them, all our machines returned to their bases.

Aug. 11th.—During the evening our flights, strongly escorted, bombarded the enemy's military works in Chiapovano Valley

(north-east of Gorizia) by dropping three tons of high explosives. The intense anti-aircraft fire was inefficacious, and the numerous hostile chasing planes, strongly attacked by our machines, had to withdraw. One was seen to land in the direction of Planina (east of Mont Nero). On the 8th inst. an enemy aeroplane, after a brisk fight with one of our chasing machines, was forced to land near Tolmino; another was brought down yesterday in our lines west of Flondar (Carso). The aviators were made prisoners.

AUGUST 12th.—Yesterday and this morning our flights, accompanied by escorting planes, returned to the Chiapovano Valley to renew the bombardment of the military works there. Having dropped more than four tons altogether of torpedo and incendiary shells and obtained direct hits on their objectives, all our battle and chasing machines, escaping the enemy's very heavy fire, returned safely to their bases. On the 10th inst. an enemy machine, beaten in an air fight, was forced to land east of Dosso Faiti (Fajti Hrib, Carso).

AUGUST 13th.—There was considerable aerial activity along the whole front.

* * *

The following details concerning the operations mentioned in the Italian communiqué of August 3rd have been received by Reuter's Agency from an authoritative source:—

The air raid on the military establishments in Pola was carried out by 36 Italian machines, but, owing to the haze, only a part of them succeeded in identifying the objectives assigned to them. They refrained, therefore, from throwing bombs in order not to hit the town and produce casualties among the civil population, and returned to their base without having accomplished any offensive action.

The principle adopted by the Italians in such cases is worthy of notice, and is in direct contrast with that of the Austrians, who, even in these nights of full moon, have thrown bombs on many inhabited localities along the sea coast and in the plain of Venetia from the mouth of the Po to that of the Isonzo.

When the first group of Italian aeroplanes, accompanied by motor-launches, which marked the route, arrived over Pola, the anti-aircraft defences, warned by the whirr of the motors, turned on all their searchlights. One of the Italian machines then loosed a parachute rocket. The enemy's searchlights suddenly went out, and the rocket showed up to the Italian aviators all the military works of this great naval station. The Arsenal, the Rock of Olives, where the base of the submarines is established, and the fleet at anchor were suddenly revealed.

On these various positions about 6½ tons of mines of 260 and 162 millimetres were dropped by two successive waves of aeroplanes. Large fires were observed in the Arsenal, and at the Rock of Olives. Returning home, the Italian aviators saw the sky lit up for a long time, long tongues of red light reaching high up into the sky.

Though the fire of the enemy's anti-aircraft batteries was very fierce and intense, all the Italian machines returned safely to their bases.

The Austrian air service has lost in the last few days three machines, one of which was brought down on July 31st by Capt. Baraera, and fell in flames in the Italian lines near Podgera. The others were brought down by Major Piccio. Of these, one fell in flames to the south-east of Tolmino, between the first and second line of Austrian trenches; the other had to land quickly about a hundred yards from the other, and was destroyed by the Italian artillery.

* * *

The newspapers report that the American Aero Mission visited various sections of this front flying thereto on Capronis, and being received by the Head of the Army in the absence of General Cadorna. Here it is allowed to be printed that the mission has arranged to supplement the Italian Air Forces if such help should be welcome.

The American Mission having left this country, the papers announce America's intention not only to devote some of her aero production to this front, but to entrust the training of some of her future pilots to the Italian Military Schools.—T. S. HARVEY.

RUSSIA.

OFFICIAL COMMUNIQUÉS.

AUGUST 7th.—AVIATION.—Our aeroplanes dropped bombs on the railway station of Baronovitchi. Successful hits were observed.

BALTIC SEA.—On August 4th and 5th enemy aeroplanes made a series of flights on the coast and islands of the Gulf of Riga. Recently there has been noticed an increase of scouting and activity in the Gulf of Riga.

AUGUST 13th.—Our aeroplanes dropped bombs on various points in rear of the enemy's lines.

BELGIUM.

OFFICIAL COMMUNIQUÉ.

AUGUST 10th.—In the evening of the 9th our artillery brought down a German aeroplane.

ROUMANIA.

OFFICIAL COMMUNIQUÉ.

AUGUST 10th.—There is considerable aerial fighting.

SERBIA.

OFFICIAL COMMUNIQUÉ.

AUGUST 12th.—Our aeroplanes dropped several bombs along the front.

TURKEY.

A report from Athens states that Allied warships have been bombarding the Turkish batteries on the coast of Asia Minor, opposite Chios, since August 7th.

British monitors were successful in reducing one of the batteries to silence, and in destroying an aerodrome installed near the enemy battery.

HOLLAND.

The "Gazette de Hollande" (The Hague, August 7th), says that the remains of an aviator, presumably British, whose body was washed up on the northern shore in a state of decomposition, have been buried in the churchyard at Cocksdorp, on the island of Texel. On one arm was a nickel wristlet watch, with leather strap, and the aviator also wore a chain ring. The clothing included black leather trousers, and grey shirt. On the waistband was inscribed, "Wallade."

* * *

The Special Correspondent of the "Daily Chronicle, writing from Amsterdam on August 8th, says:—

The tables were neatly turned on a German waterplane yesterday (August 7th) in Dutch territorial waters.

The small Belgian fishing boat Vlissingen 59, of Middelburg, was engaged in fishing when a German waterplane swooped down upon it. The machine held two fliers, and one was put aboard the fishing sloop—such a small vessel, that it is worked by only two Belgians—as a "prize crew."

Orders were given for it to make towards Zeebrugge, the waterplane skimming over the waves beside it. The flying machine, however, soon after developed a defect and turned turtle, the occupant being drowned.

The fishing boat then turned and made off in the opposite direction, two Dutch naval craft coming up with it. One took the two Belgians and their German prisoner on board, while the other took the fishing boat in tow, and all returned to Flushing.

* * *

A German who came down near Oostburg on August 5th in an aeroplane and was interned proves to be a deserter, who chose this novel method of carrying out his project.

He was attached to an aviation camp at Knocke. Having waited for a favourable moment when nobody was near he flew away and made a safe descent on Dutch territory.

* * *

A message from Amsterdam, dated August 12th, states that according to a newspaper report the British Government has granted £10,000 compensation for the inadvertent dropping of bombs on Zierikzee by a British aviator.

British official quarters at The Hague have not yet received any information on the subject.

* * *

A report from Amsterdam on August 13th states that 50 Bulgarian and Turkish officers have arrived at Ostend, and are to be employed as aviators.

[This rumour doubtless arises from the alleged fact that the Gotha Squadron which has been bombing London has as its nucleus the famous Salonika-Bucharest Squadron from Servia.—Ed.]

INDIA.

A report from Simla, dated August 10th, says that the Mahsuds have complied with the Government's terms. Three thousand of them assembled at Sarwekai, taking the oath of peace. Sir Charles Monro, in ordering the dispersal of the troops, praises the skilful operations and pluck of all arms, including the Nepalese contingent. He says that the tribesmen have for the first time felt the power of the Flying Corps.

GERMAN POISON SHELLS.

The following report was sent from France on August 9th:—

Armentières has had to be evacuated by the civilian population. The Germans for some days past have been throwing on the town a multitude of small shells which contain neither powder nor gas, but a colourless liquid. This liquid, which is similar to that which the enemy aeroplanes threw on London in the course of their last raid, evaporates slowly, producing a heavy gas, which filters through passages and descends to the cellars of buildings. This gas is very tenacious, and has somewhat similar effect to tear-producing gas. It has been found that women are greater sufferers than men, as the gas settles in their hair. Smoking is found to be an antidote to the ill-effects.

[It is well to note this fact, as it is quite probable that the same species of shell, in the form of bombs, may be used against London in the next air raid. Cellars, in such an event, are likely to be unhealthy, and top stories will be more popular. As modern bombs have a habit of penetrating to lower floors before bursting, it is probable that top floors are the best place in any case.—Ed.]

THE CURTISS CORRUPTION CHARGE.

At Bow Street Police Court on August 10th Sir John Dickinson resumed the hearing of the case in which William Augustus Casson, aged 64, barrister and retired Civil Servant, of 8, Bedford Road, Chiswick, and Wing Comdr. John Cyril Porte, R.N.A.S., are charged with having unlawfully conspired together and with Lyman J. Seeley and other persons to contravene and set at naught the Prevention of Corruption Act, 1906.

When the case was called, Mr. Casson surrendered to his bail, and Sergeant Woodhouse, warrant officer, informed the magistrate that Comdr. Porte was not in attendance.

Mr. R. D. Muir (instructed by Sir George Lewis) said he appeared for Comdr. Porte, who was ill and unable to attend the Court. He had been in bed since the last hearing on August 3rd.

A little later Dr. William Wilkinson, F.R.C.P., of Wimpole Street, arrived in Court, and entering the witness-box stated that as a lung specialist he had on Thursday been called in to see Comdr. Porte at the Russell Hotel, and found him suffering from an advanced stage of chronic pulmonary tuberculosis. He had that (Friday) morning made a more thorough examination of the case, and had come to the conclusion that Comdr. Porte could certainly not with safety attend the Court that week, and that he ought to have some weeks of rest, free from mental and physical strain, to avert certain dangers which threatened him.

After some conversation it was agreed that the case should for the present be proceeded with in Comdr. Porte's absence.

Sub-Lt. George Marsden, R.N.V.R., a barrister-at-law, who acted as secretary of the Butcher inquiry in relation to the Curtiss Aeroplane Company, said that Mr. Casson was examined before the Committee on three occasions, and Comdr. Porte on one occasion. He described some of the proceedings at the inquiry, and produced a large number of documents which were laid before the Committee.

In answer to Mr. Muir, the witness said that Comdr. Porte was not legally represented before the Committee of Inquiry, nor was anybody else. He was at no time warned that he need not answer any question that might tend to incriminate him. Nothing was said to him, as far as he remembered, to warn him that a prosecution might take place in consequence of the evidence he gave. Mr. Lyman Seeley was not a witness before the Committee, and so far as he knew there was no correspondence between the Committee and Mr. Seeley or Mr. Curtiss. The Committee did not take evidence on oath.

By Mr. Patrick Hastings.—The witness believed the Committee was appointed as the result of some questions in Parliament. It was appointed by direction of the First Lord of the Admiralty. As Comdr. Porte was a naval officer, a request to him to attend a Committee appointed by the First Lord would, of course, be equivalent to a command.

By Sir A. Bodkin.—Comdr. Porte was treated by the Committee with consideration, but his cross-examination was severe.

On August 11th Sir John Dickinson resumed the hearing of the case.

Commodore Murray F. Sueter, C.B., said that from August, 1915, to January, 1917, he was Superintendent of Aircraft Construction at the Admiralty. He first knew Commander Porte as a submarine officer, but he was invalided out of that service about 1911, and afterwards became connected with the Deperdussin Aeroplane Company, from which firm the Admiralty bought a few seaplanes. Lieut. Porte was well known as an expert in aviation; in fact, he was one of the pioneers, but had, witness believed, devoted his attention principally to seaplanes.

In 1914 there was a project for flying across the Atlantic, a prominent newspaper having offered a prize of £10,000 for the accomplishment of such a feat, and witness knew that in connection with that project the Curtiss Aeroplane Company was constructing a boat called the "America." Lieut. Porte was associated with the scheme, it being understood that he was to pilot the boat across the Atlantic. The Admiralty was very much interested in the matter, but the sudden outbreak of war in August, 1914, caused the project to be dropped. Up to that time the Admiralty had not placed any orders with the Curtiss Company.

On the declaration of war Lieut. Porte, as a Reserve Officer, returned from America to England, and reported himself for service to the Admiralty. He was shortly afterwards commissioned as a Squadron Comdr., being employed first at Hendon and then at Felixstowe. He told witness all about the "America" and her sister flying boat, and they discussed the performances of those machines. The question of the purchases of the two boats by the Admiralty was also discussed between them.

Eventually, after some controversy about price the Admiralty bought them, the negotiations being conducted through Comdr. Porte. When the boats arrived in England towards the end of 1914 they were put together at Felixstowe and tested by witness and Comdr. Porte. Witness made a favourable report upon them, and expressed the opinion that if they were developed they would be most useful machines. Contracts for four more of the same kind were then placed with the Curtiss Company, the letter with the order being sent to Mr. Lyman J. Seeley, who had been introduced to witness in October or November, 1914, as the agent of the Company.

Negotiations followed for the building of other machines and the supply of motors, and in consequence of the extensive orders given by the Admiralty the Curtiss Company enlarged their works. The Admiralty took practically the whole output of the firm from March to September, 1915. In consequence of serious delays in delivery, an Admiralty inspector was sent to America to look into the matter, with the result that great improvements were effected both in regard to workmanship and time of delivery.

In August, 1915, Comdr. Porte went to America on behalf of the Admiralty with designs for several improvements in the flying boats and their engines, and on his return in September he furnished a report on the Curtiss Company's works. This was followed by further orders to the company for aeroplanes, seaplanes, and different kinds of engines.

By the summer of 1916 the deliveries under those various orders had become very backward, thus creating a serious condition of things, and in July Lieut.-Comdr. Neilson R.N.V.R., was sent out by the Admiralty to look into the matter. He returned the following month and made his report.

It was on his return that Lt.-Comdr. Neilson mentioned to witness certain things he had heard in reference to commissions being paid by the Curtiss Company in connection with Admiralty contracts, this being the first time the subject had ever been brought to witness's notice. Prior to that time witness had never heard of or seen Mr. Casson. He knew Mr. Seeley, however, who came frequently to the Admiralty, where he was recognised as the agent of the Curtiss Company, and most of the orders and communications to the company were sent through him.

Some time in the autumn of 1916 Casson called on witness and started talking about the Curtiss Company, saying he had been connected with it and was entitled to a commission from it, but he did not explain the nature of his connection with the company, nor the amount of his commission, nor the service for which he claimed it. Mr. Casson made reference on that occasion to Comdr. Porte, saying he had known him for many years, had been a kind of father to him, and had nursed him through some of his illnesses. Witness at that interview told Mr. Casson that he (witness) had nothing to do with the question of commissions, and that if he wanted to talk about such matters in connection with any firm he must see Sir Francis Hopwood, the Additional Civil Lord of the Admiralty, who was in charge of the Contracts Department. When speaking of his right to commissions, Mr. Casson made no mention of Comdr. Porte in that connection. Witness never told Comdr. Porte about his having been visited by Mr. Casson or that anything had been said about commissions, but he reported what he had heard to Sir Francis Hopwood.

About a fortnight after the interview with Mr. Casson witness received a visit from Mr. Seeley. To him he spoke straight out upon the subject of the commissions, and asked him who had them. Mr. Seeley replied that he, as agent for the Curtiss Company, had had a legitimate commission. Witness pressed him as to whether any officers of the Air Department had taken commissions, and he replied, "No, not a single one." Witness further asked him if he had given presents to any officer, and he replied that the only instance was that of a small wedding gift to one of the flying officers on his getting married. Mr. Seeley made no allusion to Casson or Porte, and said nothing as to the amount of what he had called his "legitimate commission."

Replying to Mr. Muir, Commodore Sueter said that in the earlier days of his acquaintance with Comdr. Porte, aviation was a more dangerous job than it was now; now it was about as safe or as risky as riding in a taxi-cab. Until witness left the Admiralty early in 1917 to go on active service, Comdr. Porte had been practically serving under him from September, 1914, in the technical work of his department, but he was not his commanding officer. During that period they met probably once or twice a week, and witness knew a good deal of Comdr. Porte's work.

Comdr. Porte was certainly a very highly-skilled officer, and witness had every confidence in his judgment, as he had very great air knowledge and advised extremely well. He had also every confidence in his integrity, and would accept his word absolutely. Before the war he was aware that Comdr. Porte had some business connection with the Curtiss Company; it was common knowledge that he was to attempt to fly their boats across the Atlantic, and it was not to be supposed he would do it for nothing.

The suggestion that the Admiralty should purchase the Curtiss flying boats came not from Comdr. Porte, but from witness; that was after he had heard Comdr. Porte's account of their performances. They discussed the boats and the possibilities of improving them. Witness and the head of the Contracts Department decided to negotiate the purchase of the boats through Comdr. Porte, as, he being so well-known to the firm, they considered it would save time, which was then of vital importance.

Comdr. Porte gave him a very fair account of the performances and capacity of the boats. It was after testing them that it

was decided to offer more. Comdr. Porte was in favour of getting most of them built in this country, on account of the superior workmanship, but that was impossible at the time, as all the home firms were fully enployed on other military and naval work. When Comdr. Porte was appointed to the charge of the Felixstowe station in May, 1915, it was a comparatively small station, and the flying machines were rather antiquated from the present day point of view, though they were as good as could then be obtained. Felixstowe had now become an important station, with a great many more machines, more officers, and more men than in 1915. The type of boat had also been largely improved. That had all been done under the supervision of Comdr. Porte working in close contact with the Admiralty. The improvements had been largely due to Comdr. Porte's air knowledge and inventive skill.

As to whether the boats so improved by Commander Porte had been responsible for the destruction of a large number of enemy submarines and a few Zeppelins, that was a question he could not answer; the information would be best obtained from the Secretary to the Admiralty.

When witness relinquished the post of Superintendent of Aircraft Construction he wrote a letter (which was read to the Court by Mr. Muir) to Comdr. Porte, in which he thanked him for the highly valuable services he had rendered, and for the loyal support he had given him in his work.

Wing Commander Spenser Douglas Adair Grey, R.N., gave evidence as to going to America in November, 1914, to endeavour to expedite the output of machines then on order from the Curtiss Company. He came back with some of the machines, which were tested at Hendon and reported on favourably by witness to Commodore Sueter. He had from time to time met Mr. Seeley, but the latter never mentioned Mr. Casson to him, or made any allusion to receiving commissions on the Admiralty orders given to the Curtiss Company. The last time he met Mr. Seeley he noticed that he appeared to be living in more comfortable circumstances than formerly.

Lt.-Comdr. George Charles Neilson, R.N.V.R., was examined as to a visit he paid to America in July, 1916, in connection with the Curtiss Company's work for the Admiralty. In the following September he had a meeting at the Admiralty with Mr. Seeley, who made to him a rather involved statement respecting the division of a commission of 15 per cent. between himself and Mr. Casson. As far as witness remembered, Mr. Seeley's statement was that he himself took 7½ per cent., and Mr. Casson the other 7½, and that he (Seeley) had, in addition, a personal commission of 1 per cent.

Witness asked what Mr. Casson did to earn his 7½, and he replied something about Mr. Casson having conducted business with the Admiralty on behalf of the Deperdussin Aeroplane Company, and having put up some patents for the Curtiss Company, but the explanation was not clear. Mr. Seeley at the time appeared to be very nervous, and was almost incoherent. When witness asked him if there were any persons other than himself and Mr. Casson interested in the commissions he gave a negative reply. Mr. Seeley said, however, that Mr. Casson's knowledge of the Admiralty's methods of doing business was of great value to the Curtiss Company. Witness made some calculations and mentioned to Mr. Seeley what seemed to him the extraordinarily large amount of commission Casson was getting for doing nothing, whereupon Seeley became very indignant, and charged witness with making criminal accusations—bribery, etc.—against him and Mr. Casson.

The further hearing was adjourned till Friday next.

MR. GEORGE BERNARD SHAW ON AIR WAR.

Mr. George Bernard Shaw is credited in an interview which he has given to Mr. Arthur S. Draper, of the New York "Tribune," with the statement that "This war will be won in the sky and not in the trenches. All you have seen yet is an experimental rehearsal or two. Now that the experiment has succeeded—well, hadn't you better look after your gas mask and helmet? You will need them presently."

According to Mr. Draper, Mr. Shaw considers that air raids in which heavy casualties are inflicted have an important bearing on the result of the war. He says:—"All wars are decided by breaking through a military barrier and getting a bayonet or bomb against the brains and stomach of a nation as represented by the civilians of its capital.

"Give Sir Douglas Haig Berlin and Hindenburg may have Ypres and Albert and Bapaume and the rest of the western front. Give Hindenburg London, and Sir Douglas may as well pack his soldiers in boxes and sell them to the toy-shops.

"Which is more important—to protect the soldiers in the field or their women and children at home? And I'll ask another conundrum. What is more important—to protect the safe or the money inside of it? What's the soldier in the field for but to protect the child-bearing woman?

"Kill nine-tenths of our soldiers and male civilians and the remaining tenth can keep the population replenished. Kill nine-

tenths of the women, and the nation is dead, even if every dead woman were replaced by a live man. It is worth sacrificing a battalion to save half a dozen potential mothers." Asked his views on reprisals, Mr. Shaw replied:—

"Why should ordinary military operations be called reprisals? We don't call the great offensive at Arras a reprisal for the great offensive at Verdun. The bombardment of towns from the air is now as a much a matter of course in the war as the bombardment by siege guns from the ground.

"We have rained bombs on any German town we could get at, notably Freiburg, Treves, Karlsruhe—all charming residential towns with interesting historical monuments and valuable works of art, not to mention streets full of women and children.

"We publicly and officially claim to have dropped hundreds of bombs to every one dropped by the Germans, and we shall go on doing it until we force a decision."

A GENERAL IDEA.

Messrs. Claude Grahame-White and Harry Harper have produced another of the long series of books in which their names have been associated. The title of the latest production is "Air-Power, Naval, Military, Commercial."

The first section of the book deals with war by air in the past and in the future, and gives a very fair idea of the requirements of military aviation.

Part 2, on problems in construction, past, present and future, is an elementary disquisition on the why and wherefore of the aeroplane and its parts. Explanations being given of aerofoils, propellers, engines and so forth, and a general idea of the principles of construction in wood and steel is afforded the newcomer to the science.

The third section is devoted to our policy after the war, and stress is laid by the writers upon the necessity for Great Britain to lead the world in the matter of aviation. They advocate that the Government should subsidise the industry to make possible research into the increased possibilities of aircraft both for peace and war purposes.

Part 4, entitled, "Factors of Safety," deals with the subject of aeronautical risks, not only with regard to scientific construction, but also to the problems of safe navigation, engine reliability, and provision of adequate landing grounds, and lighting as well as with meteorological conditions.

Section 5, "Popularising Travel by Air," deals with the subject of aerial touring in peace time and with the general cost and design of machines particularly suitable for this work. The subject of training aviators is also exhaustively discussed, and the subject of Flying Clubs receives attention.

Part 6 deals with the laws of the air, naval, military, international, civilian—a subject of purely academic interest in wartime, as, unfortunately, none of the belligerents have found it possible to conform with these laws in the letter, although attempts have been made to observe them in the spirit.

Part 7 discusses the commercial era of flying, where the aspect of the problem from a purely £ s. d. point is discussed, and here again the writers return to the necessity for Government encouragement to manufacturers to attempt to develop aeronautics in this direction.

The book is adorned with 20 full page plates showing typical aeroplanes built by the Grahame-White Co., and interior views of the Grahame-White Works. The frontispiece is a life-like portrait of Mr. Grahame-White. The lesson learnt by the authors of this work is set forth in the preface as follows:—"that in the future a nation which dominates the aerial highways will dominate also those of the land and sea; that a dominion of the air must mean, ultimately, the dominion of the world."

The book is likely to be quite useful to those desiring a general idea of aeronautical affairs.

266 pp. Chapman and Hall, Ltd., price 7s. 6d. net or 8s., post free, from the William Dawson Publishing Co., Ltd., Rolls House, Breams Buildings, E.C.4.

WATER SPORTS.

A regatta was held on the Thames at Kingston on August 11th in aid of the East Surrey Regt. Comforts' Fund. The weather being fine, there was a large attendance, and as a result the promoters hope to realise something like £200 for the Fund. The principal event on the card was the eight-oared race, which was won by a Royal Flying Corps crew, stroked by Sec. Lt. A. M. Creswell, who defeated the Australian I.F. (Wattle Club). The latter, however, secured the Military Fours by beating the East Anglian Royal Engineers in the final. In the open fours the Sopwith B.C. proved too good for the Erignes R.C., while J. Spong and S. R. Cobb defeated Sergt. F. M. Stenning and Cpl. C. J. Stenning in the double sculls, H. R. Cobb winning the single sculls. In the officers' single sculls Capt. M. Leahy, a one-legged Australian officer, obtained a popular win over Lt. G. A. Olley, the old cycling champion. The military team race was won by a New Zealand team, the Royal Engineers (T) filling second place. The umpires in the rowing events were Messrs. C. W. Kent, the old Oxford and Leander stroke, and F. J. Bell, of the Kingston Rowing Club. Messrs. F. W. Maskell and W. C. Lamb were the judges.

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(*Continued on page* 488.)

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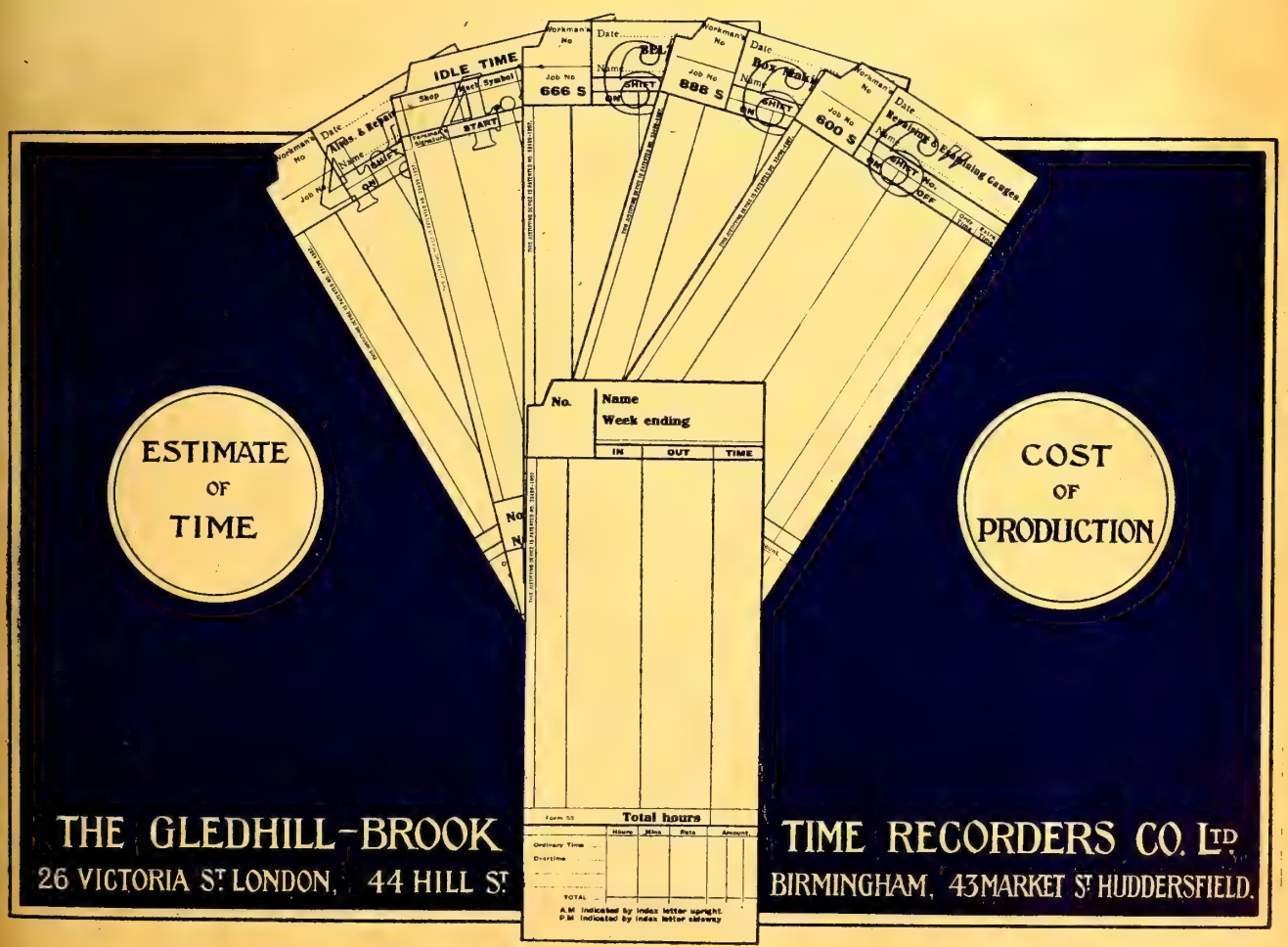

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Edited by C. Grey

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The AEROPLANE

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ON "PARAMOUNT AUTHORITY."

On Saturday last, the "Daily Express," a newspaper of very considerable circulation, put forward the somewhat startling proposition that the Right Hon. Jan Christiaan Smuts, K.C., late State-Attorney for the Orange Free State, and now Honorary Lieut.-General in the British Army, should be appointed to the sole command of "the united air service."

The "Daily Express" asks "Why should we have an Air Minister, a Naval Air Lord, and an Army Air Director, each apparently working in his own watertight compartment? Why not an air chief, with paramount authority over everything that flies, whether it is occupied by a man in the Navy's blue or in the Army's khaki?" After which comes the suggestion concerning General Smuts.

Dramatis Personæ.

Perhaps it may be well first of all to reply as briefly as may be to the questions of the "Express." In the first place, we have not an Air Minister—fortunately. We have in Lord Cowdray a very able president of a body known as the Air Board. Despite its telegraphic address that Board is not a Ministry, and it is earnestly to be hoped that it will not become a Ministry until such time as the Navy and the Army have settled for themselves the precise position within their own bounds of their respective Flying Services.

The Air Board exists for the purpose of increasing the output of aircraft, in which it is slowly succeeding. It also exists for the purpose of preventing competition in buying between the two Services, in which it has succeeded only too well, from the point of view of those who know that competition besides being merely good for trade is also essential to progress in design. It also exists to promote harmony between the two Services and the interchange of technical knowledge and experiences, in which it is succeeding quite as well as one would expect. It also exists to reconcile the demands by the Flying Services from the Ministry of Munitions with the demands of the older branches of the two Services, and here also it is succeeding to some extent. But it is not a Ministry in any sense of the word. It is a kind of cross between a conciliation board, an arbitration tribunal, a registry office, and Mr. Selfridge's Stores. Therefore, we have not got an Air Minister, and we do not particularly need one yet.

The Service Heads.

As regards the Naval Air Lord, he is a very necessary personage, and in our particular instance a very good one. A Naval Air Lord is needed to impress on their other Lordships of the Admiralty the value of a Naval Air Service, to instruct or advise them in the uses and capabilities of that Service, to administer and command that Service, and generally to represent the interests of that Service in the Board of Admiralty, consisting as it does of My Lords Commissioners for the execution of the office of the Lord High Admiral of this Realm. He has his own compartment in the affairs of the Navy just as the First Sea Lord deals with operations, the Second Sea Lord with appointments, promotion, and personnel, the Third Sea Lord with matériel, and so on. So long as the Navy uses aircraft, so long will an Air Lord be necessary.

As regards the Director-General of Military Aeronautics, whom the "Express" is pleased to call the "Army Air Director," he likewise is necessary to the Army, in the same way that his ten colleagues on the Army Council are necessary. So long as the Army employs aircraft, that arm must have a head, and that head is as necessary to the working of the Army as is any one of his ten colleagues on the Army Council, from the Chief of the Imperial General Staff down to the Director-General of Supply.

Watertight Compartments.

The "Express" apparently forgets that the whole government of England is based on the principle of decentralisation. The watertight compartments at which the "Express" seems inclined to mock are as necessary as are the watertight compartments of a liner or battleship. Centralisation, like a benevolent autocracy, requires a constant succession of genius. No section of the human race has, during the history of the world, been so fortunate as to find a supply of genius for more than a brief period.

Under a decentralised system, on the other hand, the absence of genius does not bring about general inefficiency of government. One watertight compartment may, for a time, carry on under a mediocrity without seriously affecting the parallel departments of the Government. It is only when, owing to bad design, there is delay in communication between watertight compartments when the ship of State is in full sail, that the system is open to objection.

Under a Julius Cæsar or a Napoleon Bonaparte centralised government may reach a state of transcendental efficiency, to which decentralisation cannot attain under any circumstances. Yet, as such men of genius are few and far between, it is better to ensure a constant high average of mediocrity than brief spasms of brilliancy sandwiched between long periods of comparative incompetence.

The Proposed Air Chief.

To turn now to that horrible apparition, "an air chief with paramount authority"—a phrase which conjures up dim visions of Fenimore Cooper, Major Griffiths, Gilbert and Sullivan, and transpontine melodrama. If we are to have an air chief—presumably merely because the air is a new force in warfare—then why not a petrol chief, to command all motor vehicles, on land, on sea, and in air, including cars, lorries, caterpillars, tanks, motor boats, liquid fuel ships,

motor-hauled railways, paraffin barges, aeroplanes and airships? Or why not a cook-general, to command the culinary personnel common to both Services in peace and war, because the stoking of the human machine is at least as important as any other branch of military operations?

Evidently the well-meaning people who still cry out for a unified Air Service have not yet grasped the idea that a sailor is a sailor and a soldier is a soldier, whether travelling by ship, train, horse, or aeroplane. Their technical training is different, their school education is different, they barely speak the same language. Each is entirely ignorant of the other's methods of operations, and even of the ranks of the other Service and of its words of command.

Certain elementary tactics are the same in both Services, just as naval or military aviators fight in the same way. But the higher training is entirely different in each. Therefore, why try to amalgamate two utterly diverse branches of Imperial Defence? A unified air service may sound well as a political cry, but it is absolutely opposed to naval and military needs, and to plain commonsense. One recognises, however, that commonsense and Service needs have nothing to do with politics.

The Third Service.

All of which, nevertheless, still leaves open to argument the possibility of forming a separate Air Service for aerial offence and defence entirely apart from Navy or Army. As has been pointed out many times in this paper, there are certain jobs of work which such a Service could do without reference to the Board of Admiralty or to the Army Council.

Air raiding into enemy territory would be the prime object of its existence. It could also undertake Home Defence without depleting the R.F.C. at the front and without keeping at East Coast stations R.N.A.S. units, which might be better employed on the high seas or on anti-submarine patrols round those parts of the coast where enemy air raids are never likely to occur.

Such a Third Service cannot possibly be formed until the needs of the Navy and Army are reasonably satisfied, but then it has possibilities. The nucleus of this Service could be formed by volunteers from the existing Flying Services, and probably the Senior Services would be quite willing to release such volunteers.

The Naval Air Service will doubtless in future desire that all its members shall be sailors first and "airmen" as a secondary consideration. Similarly the R.F.C. officer or man should be primarily a soldier who flies, and should regard soldiering as his life's work. Those who think more of flying than of naval or military science would be better out of their present Service, for they can never give themselves body and soul to their profession as they should do. Therefore, by all means, let them go to a Third Service which is concerned solely with air raiding and air fighting, without consideration of naval or military operations.

An Example from History.

This arrangement would introduce another watertight compartment into the Ship of State, with salutary effect, for, if either of the other Flying Services became inefficient, as it might easily do if it had a politically favoured mediocrity for its chief, there would at any rate be the two other Services to carry on two-thirds of the Empire's aerial war work efficiently. If the whole of this work were to be done by one unified air Service, under one paramount chief, the whole would fall to pieces if that chief proved inefficient.

We have only to look back to the history of the Flying Services in this war to see the truth of this argument. The Army at this moment owes its best fighting aeroplanes and its only real bombing machines entirely to the Navy, whereas if both Services had been under one paramount chief, relying, as the Director-General of Military Aeronautics did, on unfortunately-chosen technical advisers, both Services would perforce have been mounted on machines similar to those of which Major Baird, Parliamentary Secretary to the Air Board, said, "I do not deny that if they had other machines they would send them out in preference." There you have the perfect example of the result of centralisation under a paramount chief, and of the wisdom of having as much independent competition as possible to encourage progress in design.

General Smuts.

As to the suggestion that General Smuts should be the paramount chief in question, the subject is a trifle difficult to discuss. For General Smuts himself one has the sincerest admiration, despite the fact that, some seventeen years ago, he shared with the late President Kruger and General Louis Botha the same species of obloquy which the daily Press now exudes on the German Emperor, Field-Marshal von Hindenberg, and Dr. von Bethmann-Holwegg. General Smuts went on commando at the outbreak of war, and he came in after the Peace of Vereeniging, so he proved conclusively his ability to outwit our best Generals of that day.

Prior to the Boer War, he had had a very distinguished academic career in this country, and had shown legal ability to a high degree in his administrative work in South Africa. Thereafter, as a loyal subject of the King, he did excellent work in organising the defence forces of the Union of South Africa, and it is very largely due to his efforts that South Africa has contributed so valuably to our armies to-day.

In the present war General Smuts has done work of high value. He aided General Botha in suppressing the initial rebellion in South Africa: and in East Africa, where he had a species of war for which his outstanding qualities peculiarly fitted him, he achieved remarkable success, despite enormous difficulties. Since then, in a civilian capacity in this country, having handed over his East African command, he has, one believes, been very valuable to the Government in an advisory capacity.

Nevertheless, one does not immediately perceive his precise qualifications for the post of "paramount chief of a unified air service." If South African war experience is a qualification, then General Henderson's work in the Intelligence Department in South Africa is likewise a qualification, though perhaps General Smuts scored more points in slimness on those occasions when these two distinguished officers were opposed to one another.

Military Needs.

On the other hand, General Henderson and other senior officers of the R.F.C., have had greater experience of pure and applied military science, and of that practical Army routine which is so necessary when a youthful arm such as the Royal Flying Corps has to be drilled into shape. If the "Daily Express" and those in high political places whence it may draw its inspirations are dissatisfied with Sir David Henderson, it is not difficult to suggest several other officers holding substantive rank in His Majesty's Army whose military experience and whose intimate and prolonged association with aeronautics fit them peculiarly to hold command of any new, or reformed, or unified air service which may come into being in obedience to political clamour.

Despite the valuable additions which both the existing Flying Services have received from our Colonies and Dependencies, they remain, and must always remain, integral parts of the Navy and Army respectively,

and it seems fitting that they should each be commanded by an officer whose whole career has been in the particular Service with which he is associated. It is certainly regrettable that so successful a fighting man as General Smuts should not hold a fighting command at the moment, and it is still more regrettable that he should be dragged into what appears to be a political manœuvre of some kind—he is too good a man to be wasted as a politician. Nevertheless, neither his particular kind of military experience and training, nor his personal connection with aeronautics, seems to indicate him as being pre-eminently suited to reform and command the Flying Services as definite branches of His Majesty's Navy and Army.

A Distinct Possibility.

If, however, General Smuts particularly desires to command an aerial force, or if his friends in the Government are earnestly desirous of finding him employment on active service away from the contaminating influence of English political circles, there is a distinct possibility for him as officer commanding a force of air raiders, similar to that which for a period operated on the Western German provinces. Such a force, properly equipped and supplied, and under a strong and ingenious commander of the stamp of General Smuts, might quite conceivably do useful work, provided the C.O. were given a free hand, entirely independent of the two existing Services.

He might be appointed to recruit and train his own personnel, with the assistance of volunteers from the present Services, and so his force might be the beginnings of that Third Service of which one has written hereinbefore. The said personnel might be recruited from adventurers and bushwhackers of all sorts who would not be acceptable in the Regular Army; it might become a kind of aerial *Légion Etrangère*. All those pilots who have left the R.F.C. owing to incompatibility of temper might be allowed or encouraged to join it. Antecedents need not matter; present pluck and skill need be the only thing to count. General Smuts would probably be perfectly happy while engaged in licking such a force into shape, and while directing its path to glory in Germany thereafter.

In such a way General Smuts would do good service to the Empire; he would earn further distinction, and he would find an outlet for his superabounding energy and driving power. Also, the progress of the existing Flying Services along those paths of strict routine which they were originally designed to follow would not suffer alteration at the whim of politicians, and so they might in time become worthy branches of those historic Services of which they have the honour to be the youngest arm.—C. G. G.

ON A CAMPAIGN OF SLANDER.

One of the first lessons I learned when endeavouring to acquire wisdom under my revered chief, the late Mr. William Iliffe, was that when a new paper desires to advertise itself one of its best games is to start abusing an older paper in the hope of decoying it into a controversy, and thus into giving the new paper a free advertisement. Probably no group of papers have been so roundly abused by minor contemporaries as those founded by the firm of Iliffe, and probably no papers have done less to gratify and advertise their abusers by entering into controversy with them. I take it rather as a compliment that sundry minor contemporaries of THE AEROPLANE have for some time afforded me opportunities of profiting by that lesson.

It is only necessary for me to refer to the matter now because papers with small sales frequently cultivate a large free list. Some of my friends in the Services and in the Aircraft Industry have been good enough to send me from time to time copies of papers, which I should not otherwise have seen, containing attacks on me personally and on THE AEROPLANE as a newspaper, and it seems only courteous to thank them for their trouble in sending these copies. Doubtless if they apply for further free copies, the publishers of the articles will be pleased to replace those sent to me.

This seems also a good opportunity to apologise to many readers for the difficulty they experience in obtaining THE AEROPLANE. The restrictions imposed o:

THE MISFORTUNE OF WAR.—A group of British Officers of both Flying Services in enemy hands at Karlsruhe. The absence of leather boots is noticeable. These are apparently appropriated by the original captors of the prisoners.

the supply of paper make it necessary to limit strictly the number of copies printed weekly, and so the news-agents find it impossible to keep a quantity of copies in readiness for casual sales. Nevertheless, the paper can always be had by placing definite orders with news-agents, or by subscribing for copies to be delivered by post.

Notwithstanding this forced limitation of the number printed, the sales of The Aeroplane are greater than those of any other aeronautical paper, and correspondents who complain that other papers can be obtained on bookstalls when The Aeroplane cannot may fairly safely assume that all copies of this paper have been bought up, and the others left. There is no need for anyone to go without The Aeroplane if he or she will make up his or her mind to order it for regular delivery.

However, to return to my various assailants, there are so many things of real importance to be discussed at the moment that space and time are alike lacking in which to argue with those few whose positions, apart from the medium of their assault, make them worth of argument. Among the latest are Messrs. Hilaire Belloc and F. W. Lanchester, both gentlemen of considerable weight, whose combined onslaught ought, one admits, to call for correspondingly stout resistance. Both, however, detract from their momentum by being so irresistibly humorous, that they suggest rather the solemnly comic rolling of the push-ball than the overwhelming rush of the avalanche.

It is too hot and stuffy here in Town to deal with them in the spirit which their attack deserves, an attack all the more humorous in that both the assailants seem to take themselves and it quite seriously for once. However, as I have promised myself a day or two in the country, when certain really serious matters have disclosed in which direction they are developing, I may then find time in which to jape with the new Tweedle-Dum and Tweedle-Dee of aerial controversy.—C. G. G.

AIR RAID WARNINGS.

Sir William Nott-Bower, Commissioner of Police for the City of London, has issued the following notice in connection with attempted air raids over the area under his jurisdiction :

When, from information received from the military authorities, an air raid upon London is considered probable, the following steps will be taken for giving warning to the public to enable them to take cover :

In the City of London, two sound signals (rockets) will be fired in succession from fire brigade stations, so selected as to cover the area to be warned.

Simultaneously with the firing of the rockets regular and special constables on foot and on cycles will circulate throughout the streets exhibiting a "Take Cover" placard (red letters).

When the military intimate that the air raid is over, regular and special constables will be sent out, exhibiting an "All Clear" placard (black letters), and calling attention to their presence by sounding the bells of their cycles, or by sounding their whistles—two blasts in quick succession.

The public are warned that the cover taken should be effective; a doorway or open archway is not effective cover, as from a bomb exploding in a street close by protection would not be afforded. Persons in buildings are advised to keep away from the windows as far as practicable, and to vacate the top floors.

* * *

After the statement by the police at the Southend raid inquest that the siren warning was stopped by the London authorities, a conference of burgesses of the borough, representing all classes, was held. Local Members of Parliament will be approached with a view to an inquiry being held.

In 1915, after the first Zeppelin raid, an arrangement was made to sound a siren in the event of approaching hostile aircraft. On the next occasion, owing to misunderstanding between the police and the borough officials, the siren was not sounded until after all danger had passed. Apparently after that the practice was discontinued.

Since then repeated efforts have been made by the inhabitants to have some system of air raid warning installed, but the authorities on each occasion have refused to entertain the proposal. Only last week petitions were being publicly signed throughout the borough suggesting the kind of signal best suited for the locality, but by the irony of fate the town was raided one day before the list was due to close.

[It will probably be found that the stoppage of the siren took place long ago, before the defence of England was organised on the present system, and that it is entirely Southend's own fault that it has not been resumed. There was excellent reason for stopping sirens which could be heard in an airship floating about in the dark with its engines stopped, but that reasoning does not apply to aeroplanes in any case, still less in broad daylight.—Ed.]

BUSINESS AS USUAL.

From the "Daily Express" of August 18th :—

There is a certain grimness in a letter from a City firm which came into my hands, in which they say, "Referring to the air raid of June 13th, in which our old offices were destroyed and my partner and half our staff killed, we now beg to inform you that we have now settled down at the above address." There is a typically British directness about this "carrying-on" which it is good to take to heart.

AERO-ENGINE SUPPLIES.

In view of the urgent demand for increased aero-engine, or aero-engine parts, production, as supported by the maximum priority given to this class of work, it is of the greatest national importance that any firms who consider they are in a position to render assistance should write to the Controller of Aeronautical Supplies, Room 355, Air Board Office, Strand, W.C.2.

AERIAL TORPEDOES.

So many people write asking whether the weapons called aerial torpedoes in the daily press operate in the same way as water-borne torpedoes, that it seems worth while to make it plain that there is really no such thing as an aerial torpedo. The things usually called aerial torpedoes are merely rather large bombs of a torpedo shape, which, as they have less head resistance than ordinary "pudding" bombs, fall faster and have greater penetration. They are evidently intended to go through several floors of a large building and blow the whole thing to pieces instead of simply exploding on the roof and doing little harm.

The idea of an aerial torpedo in the strict sense, that is to say, a small aeroplane, automatically controlled, carrying a big explosive charge—but without anybody on board—has been suggested many times, but it is evidently useless when one considers that such a machine would be drifted off its course by the wind, and consequently would go anywhere except to the objective for which it was intended.

As the modern long range gun can fire absolutely accurately up to a range of twenty miles and can be directed onto its target by an artillery observation aeroplane, so that every shell will fall inside a 50-yard circle, there is no object in the aerial torpedo idea.

There is also a species of "aerial torpedo" which is fired from a trench mortar. This is simply a large fat bomb with things likes vanes stuck on its tail, so as to make it travel more or less straight. It has apparently been largely used in trench fighting in the wooded districts of Central France, but one has not heard of it lately on the West front. It also is not an aerial torpedo in the proper sense.

A SLIGHT MISUNDERSTANDING.

A report from Amsterdam on August 7th, reproduced in the "Express" on August 8th, seems to demonstrate German imperviousness to irony. An article in the "Cologne Gazette," contributed by a high officer, relates in all seriousness, as a proof of the efficacy of the U boats, that during the recent fighting in Flanders British aviators dropped a fly-sheet stating : "As your Ludendorff rightly observes, we unfortunately lack ammunition at present owing to the U boat war. We hope within a few weeks to change this."

The writer adds : "We Germans at the front know, as well as Germans at home, that this hope will prove illusory."

SIMPLE AND EFFECTIVE.

The Newcastle City Council on August 13th approved measures for giving warning of aircraft raids by utilising tramway services. If the raid should be at night the current will be interrupted and resumed after a minute and then finally cut off. In the event of a daylight raid the current will be cut off and a red flag displayed on each car.

THE KING'S COMMISSION.

BY "BERKELEY."

A letter has been received by the Editor of this paper dated the 8th of this month, and written, it would appear, by some non-commissioned officers of the Royal Flying Corps. They say:—

"Dear Sir,—Enclosed please find cutting from your paper. We have underlined two passages, and beg to point out, after some years' experience of the R.F.C., that men who are not mentally or socially fit for commissioned rank are certainly not fit for N.C.O. rank.

"We suggest that more brains are required to be an N.C.O. in the R.F.C. than most people imagine, also mental effort is very much required in a non-commissioned officer. One would think from 'Berkeley's' article that the R.F.C. commissioned officers were the only people who had mental or moral fitness.—Yours truly, Sgts. of an R.F.C. Squadron."

The two passages underlined are in an article of mine dealing with a possible future of the Royal Flying Corps, and suggesting that an intricate knowledge of "the practical art of flying" is not in itself a sufficient qualification for admission to the commissioned ranks of the military flying service.

It would perhaps be proper to ignore entirely an anonymous letter of this type, written, as it is, by non-commissioned officers of some years' standing, who still, it would appear, spell the word "serjeant" with a "g." Nevertheless, as it is possible that other non-commissioned officers may inadvertently have taken offence at phrases which, if carelessly read, might reflect on the efficiency and credit of their class, it is well for me to indicate the particular qualifications and duties which are expected from those who desire to hold the King's Commission.

The Great Misunderstood.

There is no class in the Empire so little understood by the general public as is that of the professional Army officer. In pre-war days he was appreciated as a brilliant ornament giving colour to a drab world on such occasions as it was necessary for him to make a public and official appearance. He was, according to ill-informed scandal, an unerring authority on the manners and the methods of the racecourse, an ardent supporter of the Divorce Court, an accomplished consumer of disguised alcohol, and a debonair villain of the piece in all the incidents of the common day.

To others equally unacquainted with the Army he was a charming slacker possessed of princely skill in the games of his class and country, and a member of a jealous caste entirely lacking appreciation of the stock-broker and the journalist, those stalwart buttresses of the realm of England. He spent his own money and his own time in the service of his King, whilst they with equal enthusiasm spent other people's savings that the pen might possess more horror than the sword.

In time of war he died gallantly enough for the same critics to be jealous of the grim and unsought advertisement that hovers for a space over the sealed grave.

Such was an only too common a view of the days of peace and war before the present contest began its history. The public, perhaps because they have known the newer officer a little more intimately, are more tolerant, and are willing to admit his power of filling the casualty lists that are in these days the only things of truth permitted in the daily Press.

The Need for Deeper Knowledge.

But a greater recognition is necessary, and a deeper knowledge should be possible. Class distinctions, which have in error been made the barrier beyond which sympathy could not penetrate, are less intense in the Army than in perhaps any other profession. That a man should be a gentleman is a high recommendation, but it is not essential that he should be so by hereditary right. Tact is the great essential. With that and efficiency there is no obstacle on the ladder of military progress.

The first thing necessary of an officer is that he should be capable of leadership when he himself has learnt the secret of obedience. There is too little recognition of the fact that an officer's main duty is to command.

The Officer's World.

That he may be qualified to do this, he must be trained in a manner specially ordained for the purpose. He must learn that his own personal interest is a small thing compared with the general good of the great service in which he is a necessary part. His King, his brother officers, and his men are the entire world to him. Politics and their miry intricacies are not for him, nor is he obliged to take note of the wishes of statesmen unless they are embodied in an order from his military chiefs.

The great difference between the commissioned officer and those beneath him lies in the responsibility which is so large a part of his life. His responsibility never ceases throughout all his progress through the service.

The Soldierly Spirit.

It is the officer who must by example ensure that the rank and file under his command shall become imbued with the most soldierly spirit of the age. He must show them the things that can be done, and those that are to the perfect soldier a thing apart. He should have no priggish reservations, but he should appreciate the manner of living that has made such soldiers as Sir John Moore and Sir James Outram an undying memory in military history.

To him falls the duty of so training his men that under all conditions they will be capable of responding to the demands made upon them. A dirty soldier or an inefficient soldier is more disgraceful to his officers than he is to himself. An officer who complains habitually of the material given him to be turned into soldiers worthy of upholding ancient tradition is indicating with painful clarity his own unfitness for the King's Commission.

Theoretic and Practical Knowledge.

If he is to train soldiers to the required degree, he must himself possess a thorough knowledge of the duties and responsibilities of his rank. No blind man could ever lead another blind man through the intricacies of a strange country. Complete theoretic and practical knowledge of those things which it is necessary for the men to know is essential.

It is not to be inferred from this that a company officer should endeavour to rival Karl von Clausewitz in strategical knowledge or Sir John Cowans in powers of administration before he can teach his men the alphabet of the military life. He should possess a full understanding of the work he has in hand, and expand his knowledge as his duties and responsibilities increase.

The Value of Games.

It is not only a knowledge of the technique of war that is required of an officer. He must be skilled in those games which, despite Mr. Kipling, have done so much in creating the best side of the national character.

Men in barracks, well fed, not greatly overworked, and with money to spend, are always in danger of selecting the simplest road to pleasure. Loafing and the saloon bar have their attractions for the soldier as well as for the worker in civil life. The nymphs and dryads proper to the pleasaunce of Hyde Park in the twilight hours do not practise their seductions in vain when the idle soldier passes through their realm.

The keen officer may do much to prevent such a condition becoming constant. By personal effort, aided not a little by personal prowess, he can fill the empty hours with sport capable of developing the best characteristics of the race. But a true devotion to the men's interests is very necessary if the highest results are desired. If appointments are to be broken, it is better for an officer to disappoint any intimate personal friend who may desire his presence at lunch or dinner than to cause one moment's unhappiness to his men. If he has promised to do anything with them, his word must be kept in the letter and in the spirit. Duty alone can be a good excuse.

RESPONSIBILITY.

In the field an officer's responsibility increases, and his work in the past is put to the test. In his power are the lives of many men, and perhaps the destiny of the Empire may turn on the manner in which he does his duty. He does not know, he cannot know, but his course is simple if his training and his practice are good. He must at all times remember that on his efforts and those of his men as an essential part of the King's forces there is laid a heavy burden of duty.

He must before considering his own comfort see that his men are in a position to get such food and rest as may be possible. In the trenches he must be a constant example of cheeriness and resolution, and in the rest camp he must lead in the provision of amusements.

FOR THE KING.

He fights for his King and all that royalty implies. He does not juggle with meaningless inchoate words, such as "liberty" or "freedom"—words which have throughout history inspired the worst passions in man. The specious platitudes of the delirious phrase-makers who accuse him of fighting for "Right" against "Might" have no meaning for him. He knows that in truth he is fighting because his King requires it.

That all officers do not regard their duties in sufficiently serious a light in no way weakens the argument. There are drones in every hive. The inherent caddishness of many young officers commissioned at the present time should encourage the others to increased effort in their lives and duties.

THE SOUL OF AN OFFICER.

Neither efficiency nor intellect can make an officer worthy of the name unless in addition the true spirit is present. The Army is no profession for the hours of work alone. Those who become soldiers must devote their entire time to its life. In work and play the effort is always made primarily for the good of the service. The soul of an officer as well as his body must be in and of the Army.

Perhaps my non-commissioned officer critics of the Royal Flying Corps will admit that special qualifications are necessary in the ideal officer, and that vigour of intellect is not the only standard of propriety.

These remarks apply equally to officers of all arms in the service. In the case of the flying officer there is no local responsibility such as is involved in the care of a platoon in the field, but on him rests the higher responsibility that on his honesty and skill in aerial reconnaissance may depend the fate of an army and the lives of thousands of men.

THE S.B.A.C.

The Second Annual General Meeting of the Society will be held at the Lounge Room, Caxton Hall, Westminster, S.W., on Wednesday, August 29th, 1917, at 4 p.m. The Annual Report and Accounts for 1916 have been sent out to Members.

A Council Meeting of the Society will be held immediately following the General Meeting.

IMBECILITY OR HYPOCRISY.

From the "Daily Chronicle" of August 15th:—

There is considerable indignation in Southend at the absence of warning in Sunday's raid, and following a public meeting a procession demonstrated before the residence of the mayor.

Some light on the position was thrown at yesterday's inquest on the 32 victims. Inspector Baker (who saw hostile aeroplanes approaching at 5.55) said the police had received notice to take air raid action at 5.22. This was done by means of communicating with the branch police stations, the fire stations, the hospital, and the railway station, and the public were warned by word of mouth through the various officials.

A juror, who asked why the sirens were stopped, was told by a police witness this was done because in the case of a raid on a Midland town the siren actually directed the hostile craft, and the blowing of the siren was discontinued in Southend because of the request from headquarters in London.

The jury in their verdict expressed the opinion that the raid was inexcusable, owing to the complete absence of anything of military importance in Southend, and the fact of it being carried out in open day. They could understand the almost inexpressible bitterness felt by the relatives, and strongly recommended that more adequate warning be given.

[Air raid warnings, outside the London area, are supposed to be left entirely to the judgment of the local authorities, so it would seem that Southend has only itself to blame. The idea of a siren being heard by people sitting beside two howling 260-h.p. engines, 15,000 ft. above it, would be excruciatingly funny if it did not throw such a glaring light on the imbecility of local authorities. Just why an air raid should be inexcusable in open day is not quite clear, especially when one remembers that not so long ago papers were calling the Germans cowards for attacking under the cloak of darkness. Verily, we are either a nation of imbeciles or of blatant hypocrites, probably both.—Ed.]

REPRISALS.

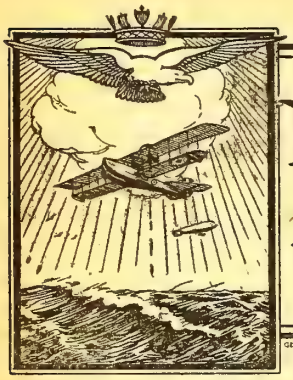
In an article dated from the Western front on July 28th, and entitled "An Eye for an Eye: a Tooth for a Tooth," Herr Karl Rosner supplies the Berlin "Lokalanzeiger" with a description of the German method of reprisal against French aviators for alleged ill-treatment of German aviators by the French. The "Times" of August 13th says that it will be remembered that Herr Rosner has achieved special fame in the description of German atrocities—not only in the matter of the Corpse Utilization Factory, but in the glorification of the German devastation of France. He writes:—

"I lately visited one of the French aviators in his quarters. On an extensive moor, formerly a French aviation ground, are placed, at a certain distance from one another, the enclosures in which the prisoners are confined singly. Each enclosure measures about forty square yards, is surrounded by posts over 6 ft. 6 in. high, and is secured by barbed wire. In the middle of the uncovered space is a low tent, just big enough for the prisoner to creep under it. Under the tent are a few wood shavings and a short blanket. A jug of water completes the furniture. A sentry with fixed bayonet is allotted to every prisoner by day and night.

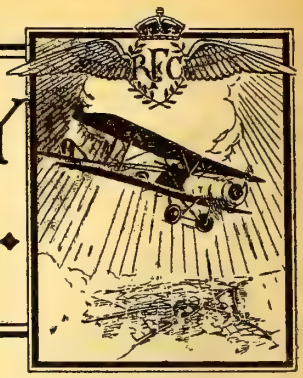
"The officer to whom I spoke had spent five days and five nights in his reprisal camp. . . Thus far the man has stood his open-air imprisonment well, although, of course, he complains of the endlessness of the days and nights, of the lack of any occupation, and of the impossibility of taking proper care of his person."

The inimitable Herr Rosner takes care to explain "how little reprisals accord with the German way of thinking in war, and how very revolting it is for the Germans to practise severity against defenceless prisoners."

[One would like to have a full and accurate account of this affair, for Herr Rosner may be turned on officially to exaggerate such stories in the hopes of making the reprisals more effective. If true, this method of punishment will merely increase the account which the Germans will have to settle with France after the war. —Ed.]



NAVAL and MILITARY AERONAUTICS



FROM THE "LONDON GAZETTE."

War Office, August 14th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing.—Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld. :—Lt. H. V. Acland, Canadian Local Forces, March 24th. Lt. W. H. Dore, Spec. Res., April 26th. Lt. V. W. B. Castle, Spec. Res., April 30th. Lt. J. A. Coats, Spec. Res., May 4th. Temp. Capt. R. E. Saul, Gen. List, from a Flying Officer, July 9th. From Flying Officers, and to be temp. Capts. whilst so empld. :—Temp. Sec. Lt. A. R. Penny, Gen. List, July 21st. Sec. Lt. G. H. S. Dinsmore, Spec. Res., July 23rd. Capt. G. Maxwell, Yeo., T.F., from a Flying Officer. From Flying Officers, and to be temp. Capts. whilst so empld. :—Temp. Sec. Lt. F. Libby, M.C., Gen. List, July 26th. Sec. Lt. (temp. Lt.) T. S. Roadley, S. Staff. R., Spec. Res., July 28th. Temp. Sec. Lt. R. N. G. Atkinson, Gen. List, July 29th.

Gen. List.—Flt. Sgt. T. D. Cole, from R.F.C., to temp. Sec. Lt., July 21st.

War Office, August 15th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing.—Sqdn. Comdr.—Capt. A. G. R. Gerrod, M.C., Leic. R., Spec. Res., from a Flt. Comdr., and to be temp. Maj. whilst so empld., August 5th.

Equipment Officers, 1st Cl.—Temp. Sec. Lt. (on prob.) H. Marsh, Gen. List, to be temp. Capt. whilst so empld., and to be confirmed in his rank, July 16th. Sec. Lt. (temp. Lt.) E. L. P. Morgan, Spec. Res., from the 2nd Cl., and to be temp. Capt. whilst so empld., August 1st.

* * *

The Secretary of State for War has received the following list of names of officers, non-commissioned officers and men whose services have been brought to notice by Lt.-Gen. Sir Stanley Maude, K.C.B., Commander-in-Chief, Mesopotamian Expeditionary Force, as deserving of special mention :—

Royal Naval Air Service.

Cassy, Flt. Lt. A. W.; Lyon, Flt. Sub-Lt. M.; Verey, Lt. D. R., R.N.V.R.; Wrottesley, Comdr. F. R., R.N.

Brennan, F.7736 Air Mech., 1st Gde., T.; Cowton, Ply. 13554 C.P.O., 2nd. Gde., A. E.; Cracknell, F.8912 Ldg. Mech. C. L.; Freeman, F.4667 Ldg. Mech. R. C.; Veale, F.9262 P.O. Mech. A. H.; Ward, F.9274 Ldg. Mech. P. H.; Young, F.9291 Air Mech., 1st Gde., E. W.

Royal Flying Corps.

Bayly, Lt. (temp. Capt.) L. J., R.A.; de Havilland, Capt. (temp. Maj. in Army) H., D.S.O., R.F.C., Spec. Res.; Forsyth, Sec. Lt. (temp. Lt.) W. A., R.A.; Hawker, Lt. T. McD., R. Ir. Fus.; Herring, Lt. (temp. Maj. in Army) J. H., D.S.O., M.C., R.F.C., Spec. Res.; Macfarlane, Sec. Lt. R. M. C., R.A.; Merton, Lt. (temp. Capt. in Army) G., M.C., R.F.C., Spec. Res.; Moxey, temp. Lt. E. R.; Rattray, temp. Lt. A. R.; Tennant, Bt. Maj. (temp. Lt.-Col.) J. E., M.C., S. Gds.; Tullis, temp. Lt. (temp. Capt.) W. W., Gen. List.

Ayling, No. 11687 (local Sgt.) S. B., Wilts R. (now No. 78877, R.F.C.); Coates, No. 1676 Flt. Sgt. W. A. H.; Deacon, No. 77481 Cpl. H.; Evans, No. 3983 Sgt. P. W.; Gardner, No. 14170 Cpl. G.; Keil, No. 5551 1st Air Mech. F.; Vaile, No. 1651 Flt. Sgt. A.; Walton, No. 4161 Sgt. F.

War Office, August 16th.

REGULAR FORCES.—The following N.C.O's. and men to be temp. Sec. Lts. :—The A.S.C.—Cpl. F. W. Southgate, from R.F.C.

Memorandum.—For duty with R.F.C.—Sgt. H. S. Starling, from R.F.C., June 25th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing.—Sqdn. Comdrs.—From Flt. Comdrs., and to be temp. Majs. whilst so empld. :—Sec. Lt. (temp. Capt.) A. M. Vaucour, M.C., R.A., May 1st. Capt. C. E. Bryant, D.S.O., Hrs., July 9th.

Adjts.—And to be temp. Capts. (without the pay or allowances of that rank) whilst so empld. :—Lt. W. A. Knox, Canadian Art.; Sec. Lt. M. A. Seymour, Spec. Res., from a Flying Officer, July 1st.

Equipmt. Officers, 1st Cl.—From the 2nd Cl., and to be temp. Capts. whilst so empld. :—Lt. J. W. Yuile, Canadian Inf.; temp. Lt. H. B. Denton, Gen. List; Lt. B. V. Grealy, Spec. Res.; Sec. Lt. (temp. Lt.) H. E. Earl, Rif. Brig., Spec. Res., from an Asst. Instr. (graded as an Equipment Officer, 2nd Cl.), School of Mil. Aeronautics, and to be temp. Capt. whilst so empld., July 1st.

Gen. List.—The following from R.F.C., to be temp. Sec. Lts. : 1st Cl. Air Mech. N. B. Arbuthnot; 1st Cl. Air Mech. W. A. Golding; 2nd Cl. Air Mech. H. Sinclair; 1st Cl. Air Mech. C. F. Straughan, May 17th.

* * *

The King has been pleased to approve of the appointment of the following Officer to be Companion of the Distinguished Service Order in recognition of his gallantry and devotion to duty in the Field :—

Australian Imperial Force.

Capt. Richard Williams, Flying Corps.

Flying at a low altitude under intense anti-aircraft fire, he attacked and dispersed enemy troops who were concentrating on our flank. On another occasion, whilst on a reconnaissance, he landed in the enemy's lines and rescued a pilot of a machine which had been brought down by hostile fire.

* * *

The King has been pleased to award a Bar to the Military Cross to the following Officers :—

Temp. Lt. William Arthur Bond, M.C., Yorks L.I. and R.F.C.

While on patrol he attacked at close range a hostile machine, which was sent down out of control. Shortly afterwards he attacked another, which stalled and fell sideways. On another date he flew over the lines at about 50 ft. and attacked a hostile balloon, bringing it down in flames. (M.C. gazetted June 24th, 1916.)

Sec. Lt. William Charles Campbell, M.C., R.F.C., Spec. Res.

He has repeatedly shown great fearlessness and skill in attacking and destroying enemy aircraft, on one occasion destroying three within one hour. He has also attacked and dispersed enemy troops from a low altitude, at all times showing the utmost disregard of personal safety. (M.C. gazetted in this "Gazette.")

Lt. (temp. Capt.) William John Charles Kennedy-Cochran-Patrick, M.C., Rif. Bde. and R.F.C.

For conspicuous gallantry in attacking hostile aircraft. Within two months he brought down two hostile machines in flames, and four others completely out of control. In addition he has driven several others down in a damaged condition. (M.C. gazetted May 16th, 1916.)

* * *

The King has been pleased to confer the Military Cross on the following Officers in recognition of their gallantry and devotion to duty in the Field :—

Sec. Lt. William Charles Campbell, R.F.C., Spec. Res.

He attacked an enemy balloon, bringing it down in flames, and returned to our lines at about 20 ft. from the ground under heavy fire. On another occasion he attacked and dispersed a column of infantry from a very low altitude. He has shown great courage and initiative throughout.

Temp. Sec. Lt. Roy Maxwell Drummond, R.F.C., attd. Aust. C.

With another officer he attacked and disorganised six enemy machines that were about to attack our cavalry with bombs. The engagement was continued until all six machines were forced to return to their lines. His skill and courage on all occasions has been worthy of the greatest praise.

Temp. Lt. Dudley Charles Eglington, R. Highrs. and R.F.C.

For conspicuous gallantry and devotion when acting as an observer. In the course of a fight with several Albatros scouts, in which he shot down one, the pilot was wounded and fell over the control lever insensible, causing the machine to dive with

the engine full on. He climbed out, standing outside the fuselage on the lower plane, dragged the pilot back, and switching off the engine, pulled the machine out of its dive. Not being a trained pilot, his act exhibited great fearlessness and skill.

Temp. Sec. Lt. (temp. Lt.) William Mayes Fry, Gen. List and R.F.C.

Diving to a very low altitude, and under heavy fire he emptied all his ammunition into the retreating enemy. During the last month he has brought down four hostile machines. He has done consistent good work as a pilot.

Temp. Sec. Lt. Cuthbert Colin Gemmill Girvan, Lanc. Fus. and R.F.C.

When on patrol he flew for 2½ hours at a height of 500 ft., gaining and dropping valuable information at Headquarters. Although severely wounded and fainting from loss of blood, he handed in his report before finally collapsing.

Temp. Lt. Louis Fleeming Jenkin, Gen. List and R.F.C.

Whilst on offensive patrol he has continually shown the greatest dash and determination in attacking enemy aircraft in superior numbers, destroying some and bringing others down out of control.

Temp. Capt. Arthur Willan Keen, Gen. List and R.F.C.

He has shown the greatest gallantry and skill in aerial fighting, and his daring in leading offensive patrols into favourable positions for attack has been the means of many hostile aircraft being destroyed and driven down.

Sec. Lt. (temp. Capt.) John Herbert Towne Letts, Linc. R. and R.F.C.

He attacked four large two-seaters, driving two down out of control and forcing the remaining two down. He has helped to destroy eight machines, and throughout has set a splendid example.

Temp. Sec. Lt. George Frederick Lines, Gen. List and R.F.C.

He rendered valuable assistance to our artillery by locating a hostile battery, descending to a very low altitude. On his return he attacked hostile infantry, inflicting many casualties. On many other occasions he has displayed similar fearlessness in attacking and bombing hostile wiring parties, infantry, and ammunition dumps.

Sec. Lt. Evans Alexander McKay, R.F.C., Spec. Res.

For conspicuous gallantry and devotion to duty in making valuable photographic reconnaissances under heavy hostile fire. His work whilst engaged on reconnaissances and patrolling has at all times shown a fine offensive spirit, notably in flying at low altitudes and engaging hostile troops with his machine-gun.

Sec. Lt. Alfred Seymour Shepherd, R.F.C., Spec. Res.

While on balloon attack he came under heavy fire from a rocket battery. He attacked this battery from a low altitude, silencing it, and dispersing the gunners. He then returned to the attack on a balloon, and fired all his ammunition, and though his machine was badly hit, crossed the line at 100 ft.

* * *

The King has been pleased to award the Military Medal for bravery in the field to the following men :—

13990 1st Cl. Air Mech. C. F. Nesbitt, R.F.C.
65519 2nd Cl. Air Mech. W. H. Poole, R.F.C.
8853 2nd Cl. Air Mech. L. Spicer, R.F.C.

* * *

The King has been pleased to award the Meritorious Service Medal to the following warrant officers and non-commissioned officers in recognition of valuable services rendered with the Armies in the field during the present war :—

5046 Sgt. E. C. Chapman, R.F.C.
1676 Flt. Sgt. W. A. H. Coates, R.F.C.
213 Temp. Sgt.-Maj. C. T. Davies, R.F.C.
77481 Sgt. H. Deacon, R.F.C.
120 Actg. Sgt.-Maj. W. Sharp, R.F.C.
1651 Flt. Sgt. A. Vaile, R.F.C.

AMENDMENT.

The following is the correct description :—

Lt. (temp. Capt.) J. G. Selby, M.C., R.F.A. and R.F.C. (M.C. gazetted July 26th, 1917), upon whom the Military Cross has been conferred.

WAR OFFICE, August 17th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING. —Sqdn. Comdrs.—From Flt. Comdrs., and to be temp. Majors whilst so empld. :—Temp. Capt. F. M. Ballard, Gen. List, March 16th. Sec. Lt. (temp. Capt.) A. K. Tylee, Spec. Res., March 21st. Sec. Lt. (temp. Capt.) G. H. Bonnell, R.F.A., Spec. Res., April 24th. Lt. (temp. Capt.) J. S. Scott, M.C., Canadian Art., June 18th. Capt. J. R. McCrindle, M.C., Gord. Highrs., T.F., August 1st.

Capt. A. M. Wilkinson, D.S.O., Hamps. R., T.F., from a Flt. Comdr., and to be temp. Major whilst so empld., May 10th. (Substituted for the notification in the "Gazette" of July 20th.)

The following Majors (temp. Lt.-Cols.) revert from Wing Comdrs., and relinquish their temporary rank :—G. B. Stopford, R.A., July 30th, seny. Sept. 5th, 1915. F. J. L. Cogan, R.A., August 4th, seny. July 12th, 1915.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld. :—Sec. Lt. (temp. Lt.) N. Howarth, R. Lan. R., Spec. Res., July 1st. Temp. Lt. L. F. Jenkin, Gen. List, July 31st. Lt. C. J. Orde, A.S.C., Spec. Res., August 1st. Lt. A. P. D. Hill, R.A., August 4th. Sec. Lt. F. H. Holdsworth, Spec. Res., August 5th.

Capt. (temp. Maj.) F. E. L. Gethin, Spec. Res., reverts from Sqdn. Comdr., and relinquishes his temp rank, July 27th, seny. Feb. 10th, 1916.

Instr. in Gunnery (graded as an Equipment Officer, 1st Cl.). —Temp. Sec. Lt. (temp. Lt.) J. C. C. Affleck, Gen. List, from an Asst. Instr. in Gunnery (graded as an Equipment Officer, 2nd Cl.), and to be temp. Capt. whilst so empld., July 1st.

Balloon Co. Comdr. (graded as a Flt. Comdr.). —Lt. (temp. Capt.) R. C. Talbot, R.F.A., T.F., from a Balloon Comdr. (graded as a Balloon Officer), July 10th.

Depot Comdr.—Capt. (temp. Maj.) M. D. Methven, Lond. R., T.F., from a Park Comdr., and to be temp. Lt.-Col. whilst so empld., July 1st.

Park Comdrs.—From Equipment Officers, 1st Cl., and to be temp. Majors whilst so empld. :—Temp. Capt. T. F. G. Strubell, Gen. List; Sec. Lt. (temp. Capt.) C. R. Huggins, Spec. Res., July 1st.

Special Appt. (graded as a Park Comdr.).—Sec. Lt. (temp. Capt.) W. R. Willis, Ind. Army Res. of Officers, from an Equipment Officer, 1st Cl., and to be temp. Major whilst so empld., July 16th.

Equipment Officers, 1st Cl.—Sec. Lt. (temp. Lt.) B. F. Crane, Spec. Res., from the 2nd Cl., and to be temp. Capt. whilst so empld., May 1st.

TERRITORIAL FORCE.—R.E.—Capt. (temp.) (temp. Maj., R.F.C.) A. ap Ellis to be Capt., prec. Feb. 3rd, 1915, and to remain secd., August 18th.

* * *

The King has been pleased to confer the Military Cross on the following Officers in recognition of their gallantry and devotion to duty in the Field :—

Sec. Lt. (T. Capt.) William Robert Sargent Wilberforce, K.R.R.C., attd. R.F.C.

During a bomb attack on our lines by hostile aircraft he attacked them single-handed, although they were superior to him in speed, and after a running fight destroyed an enemy machine. His skill and courage throughout nine months' operations have been worthy of the highest praise.

Sec. Lt. Arthur Mostyn Wray, E. Kent R. and R.F.C.

While on an offensive patrol he attacked a hostile two-seater at close range. He was at once severely wounded, and though his thigh was fractured and his machine fell several thousand feet, out of control, he managed to obtain control again and effected a safe landing. He has previously done splendid work.

Sec. Lt. Adrian Trevore Cole, Flying Corps.

With another officer he attacked and disorganised six enemy machines that were about to attack our cavalry with bombs. The engagement was continued until all six machines were forced to return to their lines. His skill and courage on all occasions have been worthy of the greatest praise.

* * *

The King has been pleased to approve of the award of the Distinguished Conduct Medal to the following non-commissioned officers and man, for acts of gallantry and devotion to duty in the field :—

22025 Sgt. R. O. Campbell, R.F.C.
54267 Sgt. C. R. L. Falcy, R.F.C.
53352 2nd A.M. J. H. Holdershaw, R.F.C., attd. R.G.A.

WAR OFFICE, August 18th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING. —Flt. Comdrs.—Temp. Lt. E. H. Tatton, Gen. List, from a Flying Officer, and to be temp. Capt. whilst so empld., August 1st. Capt. (temp. Maj.) R. M. Vaughan, M.C., R. Innis. Fus., reverts from a Sqdn. Comdr., and relinquishes his temp. rank, August 4th, seny. March 28th, 1915.

Depot Comdr.—Capt. (temp. Maj.) H. Burchall, Spec. Res., from a Park Comdr., and to be temp. Lt.-Col. whilst so empld., June 1st.

Park Comdrs.—From Equipment Officers, 1st Cl., and to be temp. Majs. whilst so empld. :—Lt. (temp. Capt.) S. S. Nevill, Spec. Res., July 5th. Lt. (temp. Capt.) H. F. T. Blowey, R.A.; temp. Capt. E. R. Bond, Gen. List; temp. Capt. R. C. Lane, Gen. List, August 1st.

OVERSEAS CONTINGENTS.—CANADA.—CAN. INF. BNS.—Temp. Capt. R. W. Bruce, from Can. Gen. List, to be temp. Capt., and is secd. for duty with the R.F.C., August 8th, 1915.

WAR OFFICE, August 20th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING. —Sqdn. Comrs.—From Flt. Comrs., and to be temp. Majs. while so empld. :—Lt. (temp. Capt.) G. G. A. Williams, D. Gds., Spec.

Res., May 10th. Sec. Lt. (temp. Capt.) R. J. Hudson, M.C., R. Fus., Spec. Res., August 4th.

Spec. Appt.—(Graded as a Sqdn. Comdr.).—Capt. (temp. Maj.) E. W. Powell, Unattd. List, T.F., from a Sqdn. Comdr., and to retain his temp. rank whilst so empld., August 6th.

Flt. Comdrs.—Temp. Sec. Lt. S. E. Adams, Gen. List, from a Flying Officer, and to be temp. Capt. whilst so empld., April 17th. Temp. Hon. Lt. M. Nares, Gen. List, from an Asst. Insp., Aeronautical Inspn. Dept., and to be temp. Capt. whilst so empld., August 1st. Temp. Lt. (temp. Maj.) S. G. Gilmour, Gen. List, to revert from Sqdn. Comdr., to relinquish his temp. rank and to be temp. Capt. whilst so empld., August 4th, seny. Jan. 8th, 1916.

Balloon Co. Comdrs.—(Graded as a Sqdn. Comdr.).—Lt. (temp. Capt.) J. R. Bedwell, R.G.A., T.F., from a Balloon Co. Comdr. (graded as a Flt. Comdr.), and to be temp. Maj. whilst so empld., August 5th. (Graded as a Flt. Comdr.).—Sec. Lt. (temp. Lt.) C. M. Down, Herts R., T.F., from a Balloon Comdr. (graded as a Balloon Officer), and to be temp. Capt. while so empld., August 5th.

Equipment Officers, 1st Cl.—From the 2nd Cl., August 1st.—Capt. T. H. Vitty, R.E., T.F. And to be temp. Capts. while so empld.:—Sec. Lt. (temp. Lt.) G. E. Upton, Spec. Res.; Sec. Lt. (temp. Lt.) J. O. Ruscoe, Spec. Res.; Sec. Lt. (temp. Lt.) E. I. David, Spec. Res.; Sec. Lt. (temp. Lt.) B. M. Iles, Spec. Res.; temp. Lt. P. R. Callard, Gen. List, from the 3rd Cl., and to be temp. Capt. whilst so empld., August 2nd. Sec. Lt. (temp. Lt.) R. N. Vyvyan, Spec. Res., from the 2nd Cl., and to be temp. Capt. whilst so empld., August 16th.

Gen. List.—Sgt.-Maj. H. Lawson, from R.F.C., to be temp. Sec. Lt., June 22nd.

SCHOOLS OF INSTN.—Ceniral Flying School.—Instrs.—Sec. Lt. (temp. Capt.) A. M. Vaucour, M.C., R.A., a Flt. Comdr., vice Capt. C. G. Bell, Spec. Res., Jan. 23rd. Temp. Lt. (temp. Capt.) (Sec. Lt., Res. of Officers), Lord G. H. L. Dundas, Gen. List, a Flt. Comdr., vice Lt. (temp. Capt.) D. A. L. Davidson, M.C., Spec. Res., Feb. 11th. Temp. Capt. H. Barker, Gen. List, a Flt. Comdr., vice Sec. Lt. (temp. Maj.) L. A. Tilney, R.H. Gds., March 15th. Capt. G. Allen, Conn. Rang., a Flt. Comdr., vice Sec. Lt. (temp. Capt.) T. Davidson, Cam'n Highrs., T.F., May 1st. Sec. Lt. (temp. Capt.) A. H. O'H. Wood, Spec. Res., a Flt. Comdr., vice Capt. (temp. Maj.) F. G. Small, Conn. Rang., May 4th. Lt. (temp. Maj.) R. Balcombe-Brown, M.C., R.F.A., Spec. Res., a Sqdn. Comdr., vice temp. Capt. H. Barker, Gen. List, June 17th. Capt. R. H. Freeman, M.C., Worc. R., Spec. Res., a Flt. Comdr., in succession to Sec. Lt. (temp. Capt.) A. H. O'H. Wood, Spec. Res., July 8th. Graded as an Equipment Officer, 1st Cl.:—Sec. Lt. (temp. Lt.) S. McClure, N. Staff. R., Spec. Res., from an Asst. Instr. (graded as an Equipment Officer, 2nd Cl.), and to be temp. Capt. whilst so empld., July 28th.

Officer in charge of Workshops.—Sec. Lt. (temp. Capt.) E. L. P. Morgan, Spec. Res., an Equipment Officer, 1st Cl., Aug. 1st.

Schools of Mil. Aeronautics.—Asst. Comdt.—(Staff Officer, 2nd Cl., graded as a Brig. Maj.).—Maj. P. E. L. Elgee, R. Berks. R., vice temp. Capt. F. A. Forde, Gen. List, July 19th.

Memorandum.—Lt. (temp. Capt.) C. A. Hooper, Spec. Res., to be temp. Maj. (without the pay or allowances of that rank) whilst comdg. an Aircraft Acceptance Park, July 2nd.

FROM THE COURT CIRCULAR.

Windsor Castle, August 15th.

The following Officers had the honour of being received by His Majesty, when the King invested them with the Insignia of Companions of the Orders into which they have been admitted:—

Bar to the Distinguished Service Order.

Comdr. Charles Samson, R.N.

The Distinguished Service Order.

Lt.-Col. John Chamier, Indian Infantry and R.F.C.

His Majesty then conferred decorations as follows:—

The Distinguished Service Cross.

Sqdn.-Comdr. Tom England, R.N.A.S.

The Military Cross.

Capt. Stanley Aitken, R.G.A. and R.F.C.
Capt. Richard Ward, Royal Welsh Fusiliers, attd. R.F.C.
Sec. Lt. G. Burkett, R.F.C.
Sec. Lt. Sydney Jones, S. Lanc. Regt. and R.F.C.
Sec. Lt. John Ralston, Scottish Rifles, attd. A.F.C.

NAVAL.

The following appointments have been made in the Royal Naval Air Service:—

August 15th.—Mr. E. W. M. Wheldon granted a temp. commission as Lt. (R.N.V.R.), seny. August 12th.

August 18th.—Flt. Comdr. (Proby.).—M. C. Brotherton, confirmed in rank of Flt. Comdr., July 18th.

Flt. Sub-Lt.—E. B. Devereux, promoted to rank of Flt. Lt., seny. May 18th.

Messrs. H. F. Mercer and J. T. Taylor, both entered as Lts. (temp.), R.N.V.R., seny. August 17th.

August 20th.—Proby. Flt. Comdrs.—W. Pennefather and G. G. H. Cooke, both confirmed in rank of Flt. Comdr., seny. July 4th.

Admiralty Communiqués.

August 17th.—A series of raids were successfully carried out yesterday (16th inst.) by the Royal Naval Air Service. Many tons of bombs were dropped on the following military objectives:—

Ostend railway station and sidings.

Thourout railway station and junction (about 11 miles east-north-east of Dixmude).

Ghistelles aerodrome (about five miles south-south-east of Ostend).

Several fires were observed.

Attacks were also made by gunfire from the air on Engel (about half-way between Ghistelles and Thourout) and Uytkerke (about one mile inland from Blankenberghe) aerodromes and on road transports.

All machines returned safely.

August 18th.—Another bombing raid was carried out at about midnight, 16th-17th, by the Royal Naval Air Service on the Thourout railway station and junction (about 11 miles east-north-east of Dixmude). Fires were caused, and it is thought that an ammunition dump was hit and the railway damaged. Many tons of bombs were dropped on the objective.

All machines returned safely.

August 20th.—Many tons of bombs were dropped during the night of the 18th-19th inst. by the Royal Naval Air Service on the following military objectives:—

(a) St. Pierre station and sidings, Ghent.
(b) Thourout station and dump (about 11 miles east-north-east of Dixmude).
(c) Bruges docks.

A bombing raid was also carried out yesterday morning (August 19th) on Snelleghem (about five miles south-west of Bruges) aerodrome, where a direct hit was made on a large shed.

On their return our machines were attacked by hostile aircraft, which were beaten off with the help of a Royal Flying Corps patrol.

One enemy machine was shot down out of control; all our machines returned safely.

The Casualty List.

Reported August 16th.

Killed.—Wykes, A. V. (accidentally), Aircraftsman, 2nd Gde., F.31501.
Died of Wounds.—Currington, S., Air Mech., 1st Gde., F.1375.

Reported August 17th.

Accidentally Killed.—Bray, Proby. Flt. Officer R. E., R.N.
Wounded.—Brock, Flt. Sub-Lt. C. G., R.N.
Slightly Wounded.—Burton, Flt. Sub-Lt. S., R.N.
Injured.—Dolman, Flt. Sub-Lt. F. W., R.N.
Slightly Injured.—Carter, Proby. Flt. Officer B. R., R.N.
Previously reported Missing, now reported Prisoner.—Holcroft, Flt. Sub-Lt. A. B.

Reported August 18th.

Previously reported Missing, now reported Killed.—Blagrove, Flt. Lt. C. R., R.N.

Reported August 20th.

Accidentally Killed.—Forman, Proby. Flt. Officer L. E., R.N.
Arnold, Flt. Lt. C. V., R.N.
Missing.—Lloyd, Flt. Sub-Lt. S. H., R.N.
Baron, Flt. Sub-Lt. M. N., R.N.
Gray, Flt. Sub-Lt. A. T., R.N.
Slightly Injured.—Smyth, Flt. Sub-Lt. G. H. G., R.N.
Wounded.—Garland, Flt. Sub-Lt. A. H., R.N.
Slightly Wounded.—Saint, Flt. Lt. H. J. T., R.N.
Previously Missing (Believed Prisoner), now reported Prisoner.—Nash, Flt. Sub-Lt. G. E., R.N.
Previously reported Missing, now reported Prisoner.—Kent, Flt. Sub-Lt. R. L., R.N.
Previously reported Missing, now reported Killed.—Roach, Flt. Sub-Lt. H. L., R.N.
Smith, Flt. Sub-Lt. H. L., R.N.

Reported August 21st.

Missing.—Strathy, Flt. Sub-Lt. F. S., R.N.
Wounded.—Abbott, Flt. Sub-Lt. R. F. P., R.N.

PERSONAL NOTICES.

Deaths.

BLAGROVE.—Flt. Lt. Cecil R. Blagrove, R.N., whose name appeared in the official list of Aug. 18th, was reported missing on Feb. 7th, 1917, and is now reported killed on that date. He was 20 years of age and was the only son of Mr. and Mrs. Stanley Blagrove, of 170, Kingston Road, Wimbledon, and was in his 21st year. At the outbreak of war he was at King's College School. He had been in France about a year and lost his life while on a bombing raid on Bruges harbour. His commanding officer writes:—"He was one of the most gallant officers who have ever

served under me, and incurred all our admiration by the coolness and thought with which he carried out all his operations. He took every risk willingly in the cause of his country."

FORMAN.—Proby. Flt. Officer Leonard Eales Forman, R.N., who died on August 16th, 1917, as the result of an accident whilst flying, was the only son of A. Frank Forman and Ellen Forman, late of Gordon Road, Ealing, W. He was 19 years of age.

WOODHOUSE.—Flt. Sub-Lt. Mosley Gordon Woodhouse, R.N., who was killed while flying on August 9th, was the second son of Arthur and Isobel Woodhouse, Tofts, Little Baddow, Essex. He was 18 years of age. He left Radley to join the R.N.A.S. in October, 1916, when just 18, and went to France in June last. He made a wonderful effort to land when in flames at 7,000 ft., and got within 100 ft. of earth, when the machine broke up, and he was killed.

MARRIAGE.

LEAGE—HIGHLEY.—On August 18th, at St. Jude's-on-the-Hill, Hampstead, Flt. Sub-Lt. Leonard W. Léage, R.N., was married to Beatrice M. Highley, only daughter of Mr. and Mrs. Highley, Finchley Road, N.W., by the Rev. B. Bourchier.

BIRTH.

GROVES.—On August 15th, at Two Gables, Beaconsfield, Bucks, the wife of Capt. R. M. Groves, D.S.O., R.N., of a daughter.

Flt. Sub-Lt. Donald W. Ramsay, R.N., who has been missing since July 7th, was last seen fighting behind the German lines. His relatives are anxious for information as to his fate, and communications will be gratefully received by Mr. N. D. Ramsay, The Grange, Alnmouth, Northumberland.

MILITARY.

G.H.Q. COMMUNIQUÉS.

AUGUST 14th, 9.5 p.m.—The enemy's aircraft continued to pursue aggressive tactics yesterday and attacked our long-distance bombing machines with great vigour. Our machines, none the less, reached and successfully bombed their objectives in every case. Artillery and photographic work was carried out throughout the day by our machines, and machine-gun fire was opened with effect upon the enemy's infantry, both in their trenches and in the open.

In air fighting seven German aeroplanes were brought down and four others were driven down out of control.

Two of our machines are missing.

AUGUST 15th, 9.45 p.m.—There was great activity in the air again yesterday, and severe fighting took place, in the course of which nine German aeroplanes were brought down and five others driven down out of control.

Seven of our aeroplanes are missing, two of which were overtaken by a violent storm when working over the enemy's lines.

AUGUST 16th, 10.5 p.m.—Throughout yesterday's attack our aeroplanes co-operated successfully with our artillery and infantry, and assisted effectively with machine-gun fire in repelling the enemy's counter-attacks.

In air fighting 11 German aeroplanes were brought down and four others were driven down out of control. In addition, one hostile machine was brought down by our anti-aircraft guns.

Three of our aeroplanes are missing.

To-day also our aircraft have done excellent work.

AUGUST 17th, 10.1 p.m.—There was great activity in the air yesterday and fighting was severe.

Although a strong west wind made it difficult for damaged machines to regain our side of the lines, our aeroplanes had greatly the better of the fighting, and were able to carry out their tasks successfully in spite of determined efforts on the part of hostile aircraft to interfere with their work.

Our activities commenced before dawn and were continued uninterruptedly throughout the day.

Hostile aerodromes were cleared with machine-gun fire from a height of a few score feet, and a total of six and a half tons of bombs were dropped on the enemy's aerodromes, railway stations, and billets.

Other machines directly assisted our infantry in their attack, harassing the German infantry and gunners with machine-gun fire and directing the fire of our artillery upon concentrations of German troops.

Fifteen hostile machines were brought down by our aeroplanes, and 11 others were driven down out of control.

One German observation balloon also was brought down in flames.

Eleven of our aeroplanes are missing.

AUGUST 18th, 9.20 p.m.—The strong west wind yesterday again told against our aeroplanes, giving machines damaged in combat east of the line little chance of reaching their aerodromes. Bombing raids and the policy of harassing the enemy's infantry with machine-gun fire were actively continued by us. Observation for our artillery was carried out all day and an unusually large number of photographs were taken.

In air fighting 12 German aeroplanes were brought down and 18 driven down out of control.

Twelve of our machines are missing, two of which collided during a fight and fell within the enemy's lines.

AUGUST 19th, 10 a.m.—On the nights of the 16th and 17th inst., enemy aircraft bombed British casualty clearing stations. Ten wounded German prisoners were killed and nine wounded German prisoners were again wounded by the German bombs.

9.7 p.m.—Strong westerly winds prevailed again yesterday. The activity of our aeroplanes was continued, and bombing raids and artillery and photographic work were carried out successfully throughout the day.

In air fighting 3 German aeroplanes were brought down and 4 others were driven down out of control.

Eight of our machines are missing.

AUGUST 20th, 8.55 p.m.—Yesterday hostile aircraft worked in large formations well behind their own lines and endeavoured, without success, to hinder the work of our bombing, photographic, and reconnaissance machines. Our bombing operations were continued. An enemy train was wrecked and much damage was caused to hostile aerodromes, dumps, and stations. Work in co-operation with our artillery was carried out with good effect, and many photographs were taken.

In air fighting two German aeroplanes were brought down and four others driven down out of control. One other enemy machine was shot down in our lines by anti-aircraft guns.

Six of our machines are missing.

[A total of 49 machines missing in the week.—Ed.]

* * *

WAR OFFICE COMMUNIQUÉ.

AUGUST 15th.—The G.O.C. the British Forces in Macedonia reports :—

Our aeroplanes have bombed the aerodromes at Livunovo (south-east of Petric), Drama (Struma front), and Gereviz (south-east of Xanthi) with good effect. All our machines returned safely.

THE CASUALTY LIST.

Reported August 15th.

WOUNDED.—St. Clair, Lt. L. F. C., Lancers, attd. R.F.C.

AUSTRALIAN FORCE.—MISSING.—Wearne, Sec. Lt. L. A., F.C.

Reported August 16th.

WOUNDED.—Budden, Lt. G., R.E., attd. R.F.C.
Hawgood, Sec. Lt. W. P., R.F.C.
Penny, Sec. Lt. A. R., R.F.C.

MISSING.—Ellam, Sec. Lt. H. J., R.F.C.

INDIAN FORCE.—PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN BULGARIAN HANDS.—Leslie-Moore, Lt. A., I.A.R.O., attd. R.F.C.

NEW ZEALAND FORCE.—WOUNDED.—Hirschberg, Capt. J., A.S.C., attd. R.F.C.

Reported August 17th.

DIED OF WOUNDS.—Dennett, Sec. Lt. T. F. P. T., R.W. Surr. R. and R.F.C.

Reported August 18th.

KILLED.—Marshall, Sec. Lt. D. E., W. Yorks R., attd. R.F.C.
DIED OF WOUNDS.—Day. Sec. Lt. H. J., Glouc. R., attd. R.F.C.
WOUNDED.—Adams, Sec. Lt. F., R. Fus., attd. R.F.C.
Coleman, Capt. F. H., R.F.C.
Jerrard, Sec. Lt. A., S. Staff. R. and R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Webb, Sec. Lt. T., R.F.C.
PREVIOUSLY REPORTED PRISONERS, NOW REPORTED WOUNDED AND PRISONERS IN GERMAN HANDS.—Kirkham, Sec. Lt. F. J., R.F.A., attd. R.F.C.
Newenham, Sec. Lt. G. A., R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Coles, Lt. W. T., Oxf. and Bucks L.I., attd. R.F.C.
CANADIAN CONTINGENT.—WOUNDED.—Revill, Capt. J. A., Inf., attd. R.F.C.

Reported August 20th.

KILLED.—Cutler, Capt. S. Le G., A.S.C., attd. R.F.C.
McMurray, Sec. Lt. S., Lond. R., and R.F.C.
Pillow, Sec. Lt. H. M. S., Mx. R., R.F.C.
DIED OF WOUNDS.—Fendall, Sec. Lt. D. J., R.F.A., attd. R.F.C.
WOUNDED.—Bathurst, Sec. Lt. A. A., D. of Well. R., attd. R.F.C.
Gibson, Sec. Lt. E. V., R.F.C.
Pierce, Sec. Lt. W. M., Mx. R. and R.F.C.
Willett, Sec. Lt. T. M., R.F.C.
MISSING.—Leal, Sec. Lt. G., R.F.A., attd. R.F.C.

Reported August 21st.

KILLED.—Walsh, Sec. Lt. A., E. Lan. R. and R.F.C.
DIED OF WOUNDS.—Gibson, Sec. Lt. I. G., W. Yorks. R., attd. R.F.C.
WOUNDED.—MacGregor, Sec. Lt. I. C., R.F.C.
Mullen, Sec. Lt. J. W., R.F.C.
Peel, Sec. Lt. A. E., R.F.C.

Continued on page 543.

AERONAUTICAL ENGINEERING

SUPPLEMENT TO "THE AEROPLANE"

INCORPORATING AIRCRAFT ENGINEERING, AERODYNAMICS, AND MATTERS PERTAINING TO THE AERONAUTICAL ENGINEER AND THE AIRCRAFT TRADER

The British Aircraft Industry.

BY CHARLES L. FREESTON.

XXV.—GWYNNE'S LIMITED.

With an essential difference, the aeroplane problem is just as much an engine problem as ever. Time was when nothing was available that was either powerful enough or within measurable distance of trustworthiness; but if nowadays we have engines that are big enough and of very much improved quality, the question of production has become paramount under war-time conditions.

Wings and fuselages may be produced with commendable celerity, but may then have to lie idle until delivery can be obtained of the engines themselves, and in the end may have to be equipped with something of inferior or less powerful design that happens to be available.

What was Lacking.

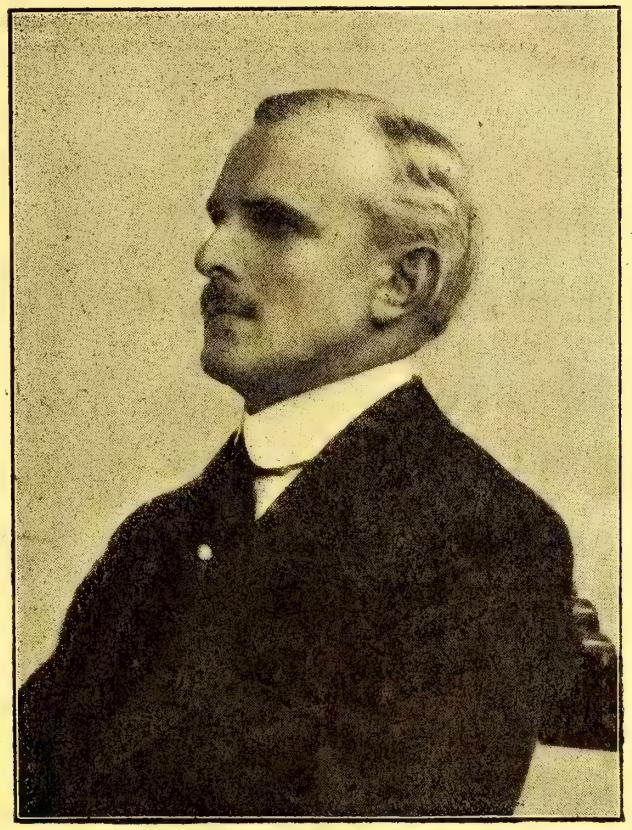
At this time of day it is almost a work of supererogation to point out that a very different state of affairs would have prevailed if greater foresight had been displayed by the powers that be in the matter of placing larger orders for engines of the right kind. In the way of rising to the occasion the manufacturers themselves have by now worked wonders, and a remarkable example of enterprise and unbounded energy in the direction of rapid development is that of Gwynne's Limited, of Hammersmith and Chiswick, who are the chief producers in this country of the Clêrget rotary motor.

Early Initiative.

Founded some seventy years ago, the firm was engaged at the time the war broke out in the manufacture of centrifugal pumps for the Admiralty at Crisp Road, Hammersmith. The Clêrget motor, however, was introduced to the notice of Mr. Nevile G. Gwynne, the managing director of the company, and in Oct., 1914, he acquired for the firm the whole patent rights of the engine for the British Empire, and proceeded to manufacture it as soon as arrangements to that end could be completed. As a matter of fact, Gwynne's Limited were the first British firm to embark upon the production of aircraft engines since the war began.

For various reasons it was desirable to obtain new premises and new machinery, and works, which for long were famous in river annals, were acquired and set going on the completion of an Admiralty order for a number of Clêrget engines.

New plant, of course, had to be installed, as the machines in use at the Hammersmith factory were too heavy for the purpose in hand. Even thus early, moreover, the task had to be faced of training existing or new employees to the new class of work.



Mr. Nevile G. Gwynne.

A Big Order.

A very much stiffer problem, however, was presented in June of last year, when an order was received for engines of large weekly deliveries. The sheds had to be converted into workshops of the completest and most modern kind, both structurally and in respect of the laying down of a most extensive and elaborate plant, while electric power had to be laid on from Hammersmith. The new works were shortly transformed out of recognition by those who knew them in the old days, and may now be regarded as among the finest in the country of those which are exclusively engaged upon the production of aircraft engines.

Already the output is enormous, but is still capable of expansion, and the spectacle which a tour of the establishment affords is eminently cheering to all who are anxious to see the British aircraft industry, in all its branches, placed upon a footing commensurate with the needs of the movement, where the war is concerned, and of such developments as will arise after peace has been declared.

A Remarkable Spectacle.

There are several noteworthy features of the new works which at once strike the beholder. One is the amazing *coup d'œil* afforded by the machine and tool-shops, which are nearly all under one roof, without intervening partitions, and cover a floor-space that can only be described as colossal in extent.

The method of distribution, moreover, is interesting, as the plan of arrangement is not in accordance with the class of work done, but with the types of machines employed. There is not, for example, a cylinder-room or a crankcase-room; the classification is such that each bay is not known by its process, but by what it contains—milling machines, bar-drawing machines, or whatever the case may be.

The amount of new plant that has been laid down is remarkable, not only as to its extent and cost, but also as to the fact that it has been laid down and set in full working order in so short a time, in these days of shortage of skilled labour.

Women Workers.

And even as to the work itself, everyone has had to be taught his or her job, even the foremen themselves. Great success,

by the way, has attended the firm's pioneer efforts in the enrolment of women workers, who now number something like fifty per cent of the total. This is an extraordinary fact in itself, when it is borne in mind that the works are entirely devoted to such eminently mechanical work as engine-building, the engine in question, too, being a complicated product which comprises over twelve hundred separate parts. None the less, the women may be observed engaged in skilled work which only a short time ago would have been regarded as altogether outside their scope.

An Example to be Followed.

There is even one department in which the work is performed entirely by women; it is the room in which the air pumps for the Clêrget motors are made, and, in contradistinction to the general plan of the works, is run as a self-contained affair. As such it has been quoted by the Ministry of Munitions as a model of what can be accomplished, and an example to be followed, in the way of utilising women's labour on mechanical work.

The output of the various bays is regulated by the progress department, which keeps in touch with every branch of work and employs a number of women, distinguished by green uniforms, whose duty it is to make inquiries in every section.

Twenty-two Operations.

The viewing methods are also very thorough. In the making of the Clêrget cylinder there are no fewer than 22 different machine operations, and each one is viewed in passing before the next stage is entered upon. In this way considerable savings are effected, as a part that has to be "scrapped" is condemned forthwith instead of the fault being discovered after further work has been expended upon it fruitlessly.

Thoroughness, in fact, is the key-note of every department of the works, and its culmination may be found in the stores, where every part of the engine has its sequence number, and is interchangeable. Some of the parts are also interchangeable with Le Rhône and Gnôme engines. Already the stores are well furnished with spare parts.

A Marvellous Development.

So great is the demand for Clêrget engines that the pump works at the Hammersmith factory are almost entirely shut down, and they are devoted to feeding the Chiswick works. High pressure centrifugal pumps for the front are still being produced at Hammersmith.

The two factories together employ an amount of labour which would probably provide food for surprise if the actual figures were to be stated, and present a scene of war-time activity which is little short of marvellous when it is reflected that the reorganisation and enlargement were only undertaken in the latter half of 1916.

The Clerget Motor.

Of the Clêrget engine itself it is impermissible, of course, to say anything as to its newest phases. All those in touch with the flying Services will know what good services it has performed particularly on Sopwith machines. A word may be said, however, as to its earlier history for the benefit of newcomers into the aviation world. It first attracted notice at the Paris Aero Show of 1910, when two examples were exhibited. One was a vertical 50-h.p. four-cylinder model, and the other an eight-cylinder "V" type of 200 h.p., the latter being probably the most powerful aircraft motor produced up to that date.

The 50-h.p. seven-cylinder rotary motor appeared at a later date, and was used with success on the Deperdussin and Nieuport machines, and in October, 1912, M. Janois used it in a flight of 2½ hours. It had a bore of 120 mm., with a 120 mm. stroke, and weighed 200 lbs. It used 4.75 gallons of petrol and one gallon of oil per horse-power. In September, 1913, its inventor, M. Clêrget, a mechanical genius who was chiefly interested in experimental work, was joined by M. Blin, of the well-known automobile firm of Malicet et Blin, and the new partnership of Clêrget, Blin et Cie. distinguished itself by the production of an 80-h.p. engine and subsequently a 110-h.p. model of great effectiveness. On an 80-h.p. Henri Farman biplane, in December, 1913, M. Testulat climbed 1,000 metres in 12½ minutes, carrying a useful load of 300 kilogs.

The well-known 130-h.p. nine-cylinder model, the dimensions of which are 120 mm. by 160 mm., has, of course, placed innumerable fine performances to its credit at the front. But of what can be accomplished with a good engine of even smaller type, when the combination includes a good machine, a good pilot and a good observer, it may be mentioned that an 80-h.p. Sopwith enjoys the record of bringing down fifteen Hun machines within 24 hours.

SOME WORKS MAGAZINES.

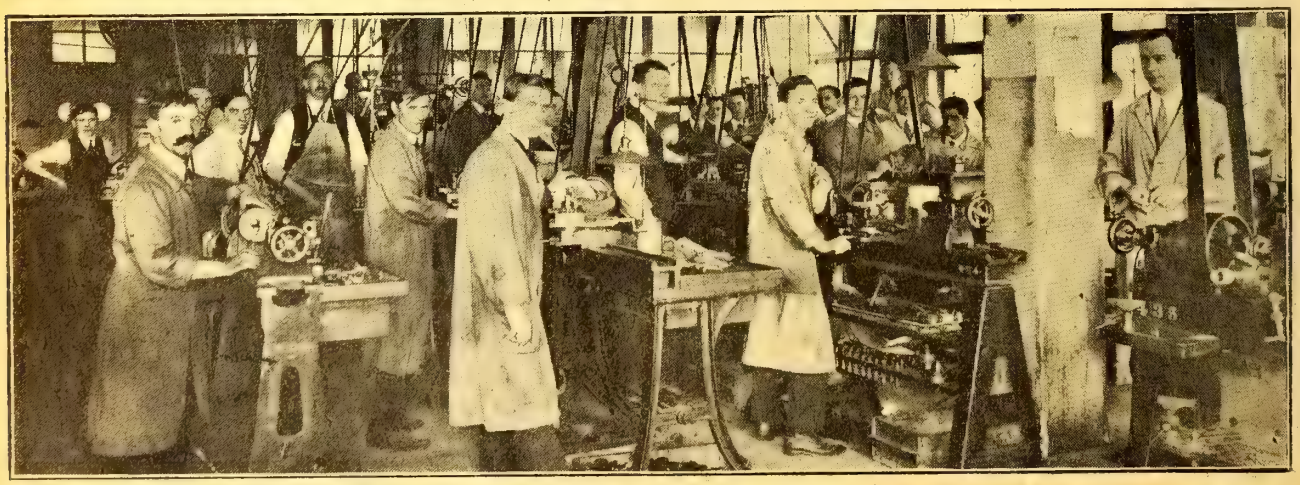
The August number of "The Highflyer," the unofficial organ of the Norman Thompson Flight Co., Ltd., of Bognor, has duly arrived, and the energetic ladies who edit it are to be complimented on their efforts, especially as they managed to produce it before the August holiday so as to give purchasers a chance of thinking over their sins without the distraction of the workshop. "The Highflyer" does not set out to be severely technical or even to confine itself strictly to aeronautical matters, but it is, none the less, readable for all that. The contents range between "The Enlisting of a Shover," to a beautiful poem entitled "The Gift," which, after two verses of the real article in poetry, suddenly presents one with the fact that the gift is that priceless jewel, a pound of sugar. The first impressions of a New Chum at the Works is really an excellent effort. The Editresses will be pleased to receive copies of other Works Magazines.

The "B.P. Magazine" (the house organ of Boulton and Paul, of Norwich) for July is No. 1 of Volume 2. Congratulations to the Editor on having completed the first volume. The magazine keeps up its high standard of excellence and rivals any technical magazine in its practical information. The third of a series of very good notes on timber, by Mr. W. G. Flood, is published in this number. The Competition Page, conducted by Mr. G. C. Clayton, continues to be highly educative, and one only wishes that one could reproduce many of the hints and tips therein. Unfortunately, to do so would very probably assist the enemy by giving him new ideas in the production of aircraft.

The July "Joy-Stick" continues the series of articles on Avro Milestones, and also the sketches of the types of aeroplanes we may build after the war. The July type is apparently a desert patrol very similar to the old totally enclosed Avro. It seems that the duty of this machine is to search uncharted parts of the desert in search of lost travellers from trade routes. Rather an ingenious idea this, but one doubts whether the number of such stray travellers would be worth the cost of the petrol expended in searching for them. The August issue, also to hand, is of the usual local interest.

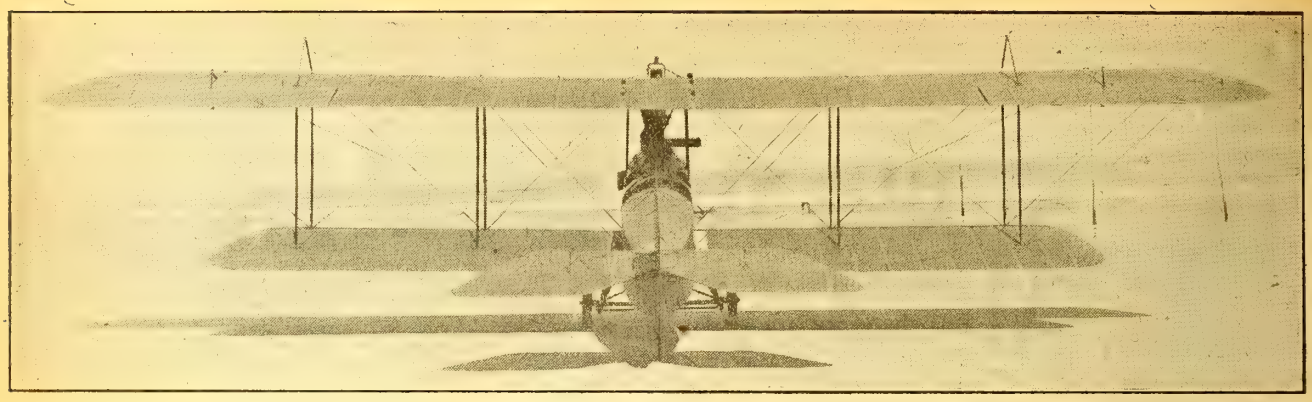
A NUMBER TO BE NOTED.

The Aircraft Industry will do well to note that the telephone number of the Sopwith Aviation Co., Ltd., Kingston-on-Thames, is now changed to Kingston 1988. This number embraces 6 lines, and therefore there should be no difficulty in communicating with the firm.



AT THE B.L.I.C. MAGNETO WORKS.—The Insulation Section, where the distributor slip-rings are turned out.

An American Training Machine.



The Standard Model "J-R" Military Training Tractor, with Hall-Scott 175-h.p. motor.

The Standard Model "J-R" is one of America's recent productions in the way of an advanced training machine. It is similar in general form to the Standard Model "J" Military Preliminary Training Tractor. The 90-h.p. motor has been replaced by a special Hall-Scott 175-h.p. motor, and the R.A.F. No. 3 wing curve has been superseded by the U.S.A. No. 6, illustrated recently.

Some leading features of the "J-R" model are as follows :—

(1) The two-wheeled steel landing gear combines lightness with strength and is perfectly streamlined throughout so as to offer a minimum of head resistance. On landing, the axle rises in vertical guides, and when normal rests in a U-shaped steel case streamlined with aluminium.

(2) All wing struts are provided with ball and socket fittings.

(3) An auxiliary fan, driving the gear fuel-pump, projects out from the fuselage, and pumps the fuel from the main tank to the gravity tank.

(4) The engine-bed is made very rigid by means of steel tube stays which connect the ash engine supports to the longerons.

(5) There is a single control of the Dep. type in the rear cockpit.

(6) The radiator is mounted over the motor and is free from vibrations. It strikes one, however, that it produces immense head-resistance.

(7) There is a single complete manifold for the exhaust.

(8) The exhaust pipe leads the gases over the top plane.

(9) Throughout the entire machine, the weight has been kept down and yet none of the strength or air-worthiness has been impaired.

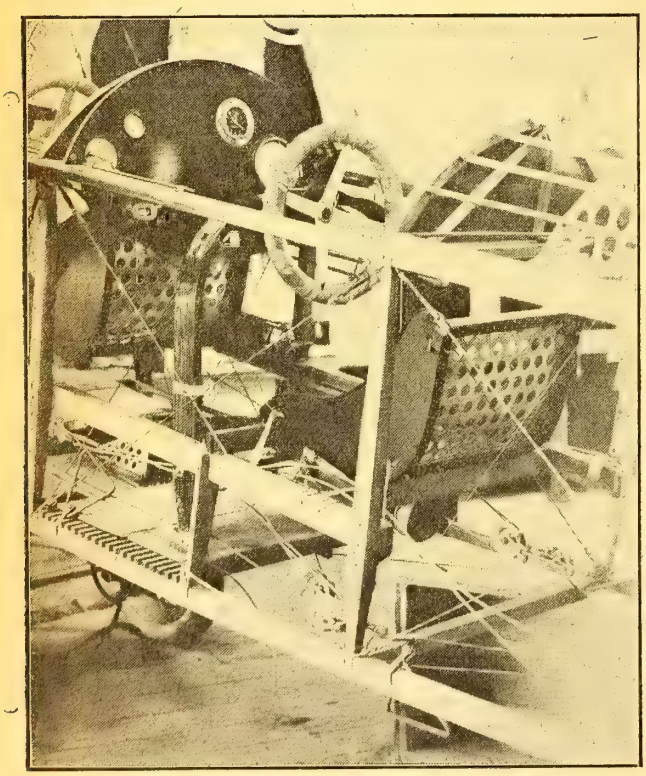
GENERAL SPECIFICATIONS.

General Dimensions.

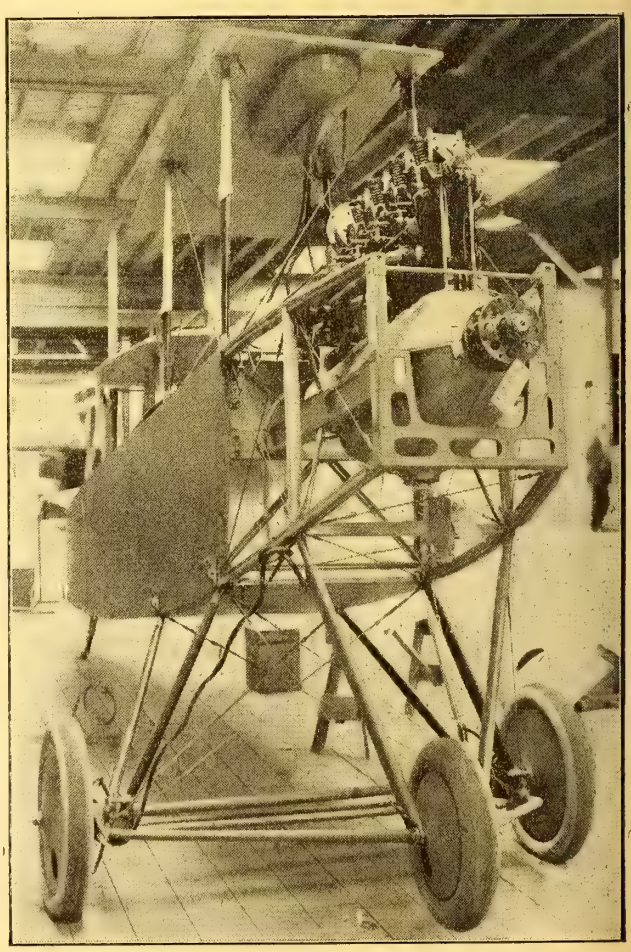
Wing span, upper plane	42 ft. 10 in.
Wing span, lower plane	31 ft.
Wing chord	6 ft.
Gap between wings	71 in.
Stagger	10 degs.
Overall length of machine	27 ft. 2½ in.
Overall height of machine	10 ft. 10 in.
Angle of incidence	2½ degs.
Dihedral angle	3 per cent.
Sweepback	5 degs.
Wing curve	U.S.A. No 6.
Tail plane, angle of incidence	0 deg.

Areas.

Upper wing	258 sq. ft.
Lower wing	159 sq. ft.
Total supporting surface (wings and ailerons)	417 sq. ft.
Ailerons (each 21 sq. ft.)	42

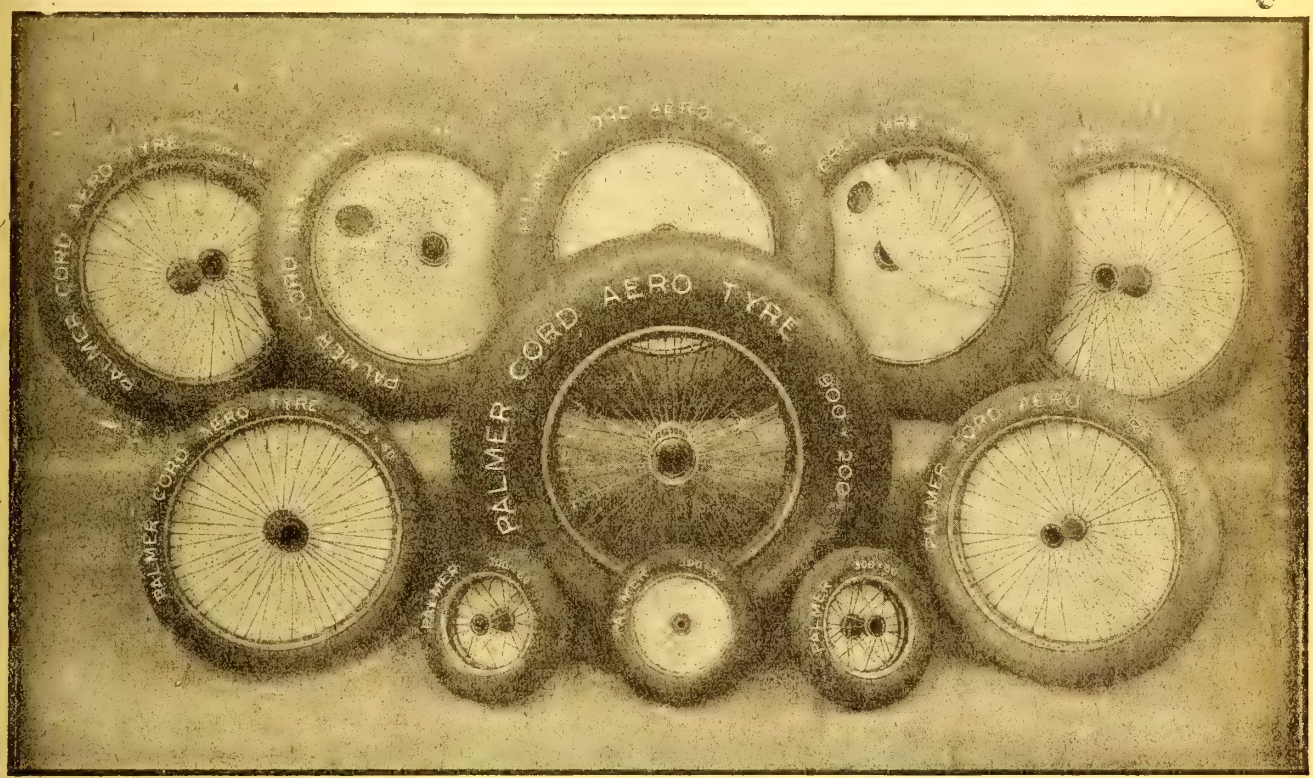


The Pilot's Cock-Pit of the "J-R" Tractor.



The Engine Bearers and Fore Part of the "J-R" Tractor.

PALMER
CORD TYRES and WHEELS For AEROPLANES



STANDARD SIZES:

Tyre Sizes	Wheel No.	Hub		Traok Line	Tyre Sizes	Wheel No.	Hub		Track Line	Tyre Sizes	Wheel No.	Hub		Track Line
		Length	Bore				Length	Bore				Length	Bore	
		m/m	m/m	m/m			m/m	m/m	m/m			m/m	m/m	m/m
300×60	16	111.12	25.4	Central	700×75	75	178.	31.75	132/46	750×125	26	150.	40.	Central
,,	17	72.39	12.7	Central	,,	*80	178.	44.45	132/46	,,	33	150.	38.09	Central
450×60	30	89.	31.75	Central	,,	*91	178.	31.75	132/46	,,	66	178.	38.89	132/46
575×60	14	150.	38.09	104/46	,,	*98	178.	44.45	Central	,,	96	178.	55.	132/46
,,	21	160.	28.	Central	700×100	2	185.	55.	135/50	800×150	8	185.	55.	135/50
,,	34	150.	31.75	104/46	,,	4	185.	55.	Central					
650×65	9	178-	44.45	132/46	,,	18	178.	44.45	132/46	,,	10	185.	55.	Central
,,	20	178.	38.09	132/46	,,	26	150.	40.	Central	,,	†36	185.	55.	135/50
,,	75	178.	31.75	132/46	,,	33	150.	38.09	Central	,,	†40	185.	60.32	135/50
600×75	14	150.	38.09	104/46	,,	66	178.	38.89	132/46	900×200	42	185.	60.32	125/60
,,	21	160.	28.	Central	,,	96	178.	55.	132/46	,,	47	185.	55.	125/60
,,	34	150.	31.75	104/46	750×125	2	185.	55.	135/50	1000×150	97	250.	65.4.	Central
700×75	9	178.	44.45	132/46	,,	4	185.	55.	Central	1100×200	52	185.	55.	116/69
,,	20	178.	38.09	132/46	,,	18	178.	44.45	132/46	,,	57	185.	55.	Central

**Wheels Nos. 80, 91 and 98 are fitted with a wider and stronger rim, and the 700x75 tyres when fitted to this rim caliper 83 m/m.*

†Wheels Nos. 36 and 40 are of stronger type than the other wheels for 800x150 tyres.

THE PALMER TYRE LIMITED

Contractors to the Admiralty and to the War Office,

119, 121, 123, SHAFTESBURY AVENUE, LONDON, W.C.2.
Telegrams: "TYRICORD, WESTCENT, LONDON." **Telephone:** GERRARD 1214 (Five lines).
PARIS: 24, Boulevard de Villiers, Levallois-Perret.

Tail plane	23.7 sq. ft.
Fin, vertical	3.7 sq. ft.
Elevators (each 11 sq. ft.)	22
Rudder	10 sq. ft.
Max. load per sq. ft. supporting surface	5.75 lbs.
Max. load per h.p.	13.7 lbs.

WEIGHT.

Net weight, machine empty	1,764 lbs.
Gross weight, machine loaded	2,400 lbs.

PERFORMANCE.

Max. speed, full load	95 m.p.h.
Min. speed, full load	48 m.p.h.
Gliding angle	1 to 11
Climbing speed in 10 minutes	5,000 ft.

POWER PLANT.

Hall-Scott A-5A special, 6-cyl. vert. four-stroke cyl. water-cooled.

Horse-power (rated at 1,400 r.p.m)	175 h.p.
Weight	605 lbs.
Bore on stroke	5¼ in. by 7 in.
Fuel consumption per hour	14 gals.
Fuel tank capacity	51 gals.
Gravity tank capacity	7¾ gals.
Total tank capacity	58¾ gals.
Oil capacity in crank-case	4 gals.

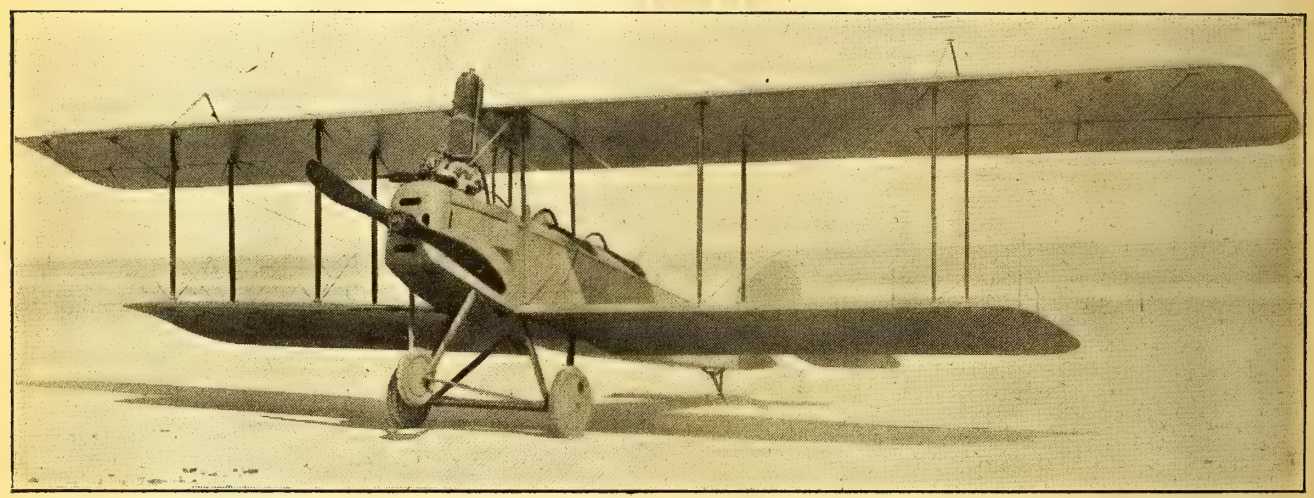
PROPELLER.

Make	"Standard."
Material	black walnut.
Diameter	8 ft. 4 in.
Pitch	5 ft. 6 in.
Direction of rotation (viewed from pilot's seat)	clockwise.

LANDING GEAR.

Number of wheels	2
Size of wheels	26 in. by 4 in.
Thread	68¾ in.

As may be seen from the firm's own figures for performances, the machine cannot be used for war purposes, as the maximum speed would have to be increased by 25 per cent. and the climb by 100 per cent. before it would be safe to send over the lines three months' hence. Nevertheless, in the advanced stages of training, after a pupil has left the slow preliminary types, and before putting him onto war aeroplanes, the machine should find a distinct field of usefulness.



Front View of the Standard "J-R" Tractor.

THE ETERNAL MAGNETO.

People in the Aircraft Industry who are interested in engines, have long suffered from the belief that British-made magnetos are not of the same quality as their German ancestors. In the early part of the war this was, unfortunately, only too true. The Magneto Industry, despite its vital importance to the Motor and Aircraft Industries, had been scandalously neglected, and it was only when the stress of war demonstrated painfully to what an extent this country had relied on its enemies for its most vital necessities, that efforts were made to bring the Magneto Industry into its proper place in the scheme of things.

Now, however, the British Industry is able to hold its own with that of any country in the world, and one is glad to see that the British magneto firms are adopting practical methods of demonstrating the fact to all and sundry. One excellent method of doing so is that adopted by the M.L. Magneto Syndicate, Ltd., of Coventry.

This firm has issued for the education of all and sundry a thoroughly convincing booklet on the methods by which the M.L. magneto is produced. The booklet opens with a brief exposition of the magneto situation before the war, showing how the German Government subsidised and supported the German magneto manufacturers and recognised the extreme importance this key to industry would assume in the event of war, and relates how this firm, then known as Morris and Lister, Ltd., electrical engineers, realised the vital necessity for the manufacture of magnetos in this country.

The firm possessed excellent general experience in the winding of fine coils similar to those used in magneto work, and by skilfully concentrating their technical and manufacturing resources, they managed to produce a considerable number of magnetos, which were on trial by a number of leading motor manufacturers within three months of the outbreak of war. So satisfactory were these magnetos, that contracts were promptly placed by many motor firms, and early in 1915 a separate company was formed under the name of the M.L. Magneto Syndicate, Ltd., and the present large and commodious works were equipped for a large output.

The booklet then proceeds to describe and illustrate the various departments of the works in a most interesting manner. The illustrations show that the bulk of the work is done by girls and boys, with the assistance of a few highly-skilled men to superintend the more vital and highly technical work. Anyone interested in the magneto question should certainly obtain a copy of the book, which may be obtained from the the firm by mentioning this paper.

VARNISH.

Few industries are more interested in the subject of varnishes than the Aircraft Industry, therefore, a neat booklet, issued by the old firm of Naylor Bros., Ltd., of Southall, is particularly apposite at the moment. The booklet gives such information about the firm as is likely to inspire confidence in all its products. In this instance the question of aeroplane varnish is left untouched.

The scope of the Naylor varnishes is indicated by the fact that the first use to which attention is drawn in the booklet is the "finish of the factory." As the author points out, factory owners and designers have learnt that it pays to have factories which are built to give the greatest efficiency, and as a necessary corollary the finish of the factory itself is quite as important as the finish of the factory's products. That is to say, the use of proper paints and varnishes on the woodwork of the factory, properly reliable distemper on the walls, and proper stain on unpainted wood, all help to make the work done in office and workshop the better. The necessary paints, stains, and so forth for outside work, are also supplied, and a special white paint, so composed as not to change colour under the effect of chemical fumes, is turned out for use in laboratories. Also special coach paints are produced for wagons of all sorts, in fact, there is nothing in the way of protective covering for workshops and their accessories that the firm cannot supply. Considering the amount of workshop extension that is going on at present, this little booklet should be of considerable interest to manufacturers of aeroplanes and builders of factories alike. Copies can be obtained from the firm's London office at 407 and 409, Oxford Street, W.1.

The Production of Aeroplanes and their Components

(Tenth Instalment.)

BY STEPNEY BLAKENEY.

Annealing.

The batch of fittings having been completed, the next thing to do is to anneal them in a gas-fired furnace, so that they may be of the correct hardness or softness. Many excellent types of these furnaces are made by some of the best firms making gas fittings and apparatus.

The annealing furnace must, of course, be fitted with a pyrometer of an approved design, and, although expensive, these instruments pay for themselves, because they prevent fittings from being unnecessarily over-heated, and prevent gas from being wasted. They also let one know that the correct temperature has been reached, and they therefore prevent fittings which are imperfectly annealed from being used, which, of course, is a safeguard to the firm's reputation. They are, of course, required by the A.I.D.

Gas furnaces require handling in an economical manner, or considerable waste of gas is possible, and they soon become an expensive item in the firm's charges. It would hardly be advisable to light up the furnace for a couple of small fittings, so one should wait, if possible, for a fair batch of them. It is not advisable either to purchase too large a furnace at first.

Further Thought.

Having outlined a generally accepted method of producing wiring plates of one kind, it is superfluous, almost, to add that this method may be adopted with certainty of quick production, to most other kinds. Of course, there are sheet metal fittings which really require the skill and thought of an expert sheet metal worker, and in many cases it is frequently necessary to experiment as to the best methods to be adopted. Two or three attempts may have to be made before a fitting is produced successfully, and in such a manner as permits of repetition work.

There are many methods of making things, but in our days, unless they are capable of being used on a commercial basis, they are useless, and further experimenting and thought are necessary.

Bolt Making.

Assuming that the wiring plates used in the construction of the fuselage have been made, and bent, and passed into the finished part stores, the next question to be considered is, are the bolts in stock? If they are, so much the better, but it is quite probable that about a couple of days before they are wanted, somebody may have discovered that only half the quantity have been delivered, and that it is uncertain where the next lot will come from. We will therefore assume that the hexagon steel bar required for making these bolts is in stock or can be obtained quickly.

Under these circumstances, it is decided to make an immediate start on production. The Capstan lathe selected for the purpose will be a ¾-in. Capstan, fitted with wire feed, and with suitable colletts, which is the technical term for the jaws in the chuck which grip the bar which is to be turned down into bolts.

The bar steel being available, a length of 6 to 7 ft. will be fed through the support attached to the lathe head on the left-hand side of the lathe and right through the lathe head until it comes through the colletts to where it comes in contact with a stop in the Capstan head.

The next thing to do is to prepare the cutting tool, for cutting down the bar to the required size of the bolt.

The Capstan lathe not being provided with tools, it will be necessary to obtain what is called a box tool holder, which has a shank turned down to fit into the Capstan head, and into the box tool holder is fitted the cutting tool and the Vee guide or support for the turned bar as it passes the cutting tool.

Capstan Setting.

The cutting tool is put into the box tool holder and held in position by means of a set-screw screwed down onto the top of the small piece of high speed steel forming the tool. This tool is formed in various ways, according to the ideas and experience of the Capstan setter-up. Some prefer to fix the tool up to cut level with the axis of the steel bar, and others prefer to have the tool inclined upwards at an angle. This detail, however, will be settled by the foreman of the machine shop.

The next tool to be fitted into the Capstan head tool holder will be the circular button die and holder, with special disengaging head, so that the operation of screwing can be stopped practically instantaneously at the end of the desired length of screwed thread. The reversing of the Capstan for unscrewing the die can be done by hand or with a slow reverse belt drive, whichever is more convenient.

The next tool to be fitted will be the cutting-off tool, or parting tool, in the cross slide, for the purpose of parting off the newly turned bolt from the bar.

All the stops for the semi-automatic working of the Capstan having been adjusted and locked with the lock-nuts, the next thing to do will be to attempt to make the first bolt. Of course, the first few may be expected to be failures, as various adjustments will have to be made until the correct diameter of the turning is arrived at, and also till the screwing, parting off, etc., have been tested.

Capstan Turning.

It will possibly be as well to detail the operations, which can be carried out far more quickly than it takes to write it.

The first thing to do will be to start the lathe, turn on the "cutting compound" so that it thoroughly lubricates the front turning tool, catch hold of the long lever which operates the slide carrying the Capstan head tool holder, and press the turning tool up against the hexagon bar steel, thus reducing it to the required size and length, which are determined by the stop.

Having completed the turning down of the hexagon steel bar to the required diameter and length, which, by the way, is all done in one cut, comprising the roughing and the finishing cut, the next operation is to reverse the movement of the lever, and move the Capstan head back.

This movement brings into position the button die, or what is frequently used, when obtainable, a geometric die head, containing the dies. Pull the lever forward, and gently but quite firmly press the die up against the end of the bolt. The die will then commence to cut the thread. Continue pressing until the lever will travel no further. The die will continue to cut probably a couple more threads, and then the die head will automatically become disengaged from the hollow die head holder, and will continue to travel round with the bolt.

Reverse the belt drive, if fitted, as it should be, and the die will work itself off the bolt.

Having completed the cutting of the thread on the bolt, it now remains to part off the bolt from the bar. For this purpose we now turn to the cross slide and take hold of the feed handle and bring the tool up against the hexagon bar, which promptly cuts off the bolt, which falls into the tray underneath.

Chamfering.

Assuming that a number of these bolts have been made, they will have to be taken to another Capstan lathe, if available, and there have the heads faced off and chamfered. This is done in one operation, by the tool fitted into the cross slide tool holder. The operation consists of picking up the bolt and slipping it, thread first, into the jaws of a collett and then pressing the tool in the cross slide across the face of the hexagon head of the bolt, and cleaning off the head and chamfering. This operation having been completed, the bolt is taken out, and the operation of bolt making is finished.

Nut Making.

The bolt will now require a nut, and the same sized hexagon bar will, of course, be suitable for making the nuts. The setting up of the Capstan for nut making consists of fitting a stop for adjusting the feed of the bar, thus allowing only the correct length of bar to be fed through. Having done this, a tool for facing and chamfering the nut should be fitted into the tool holder of the cross slide on one side, and a parting-off tool in the tool holder on the opposite side.

Also a centre bit can be fixed in the Capstan head tool holder, for giving the twist drill, which is also in the Capstan head, a true start. This twist drill is, of course, a tapping size.

The procedure of work consists first of facing and chamfering the head of the nut. This being done, centre the nut into the centre bit ready for drilling. Then reverse the lever and bring the twist drill into operation and drill the hole through nut. When this is done, part off the nut, which can be tapped in a small jig in a tapping machine, which is quicker than tapping in the Capstan lathe.

The time taken to produce, say, ¼ in. bolt and nut, about 2½ in. to 3 in. long, may roughly be assumed to be about four minutes. From this it will hardly be necessary to point out how very valuable a few Capstan lathes, or even one only, can be in a workshop, in case of delay in delivery of bolts from the recognised manufacturers.

(To be continued.)

A REORGANISATION.

Reorganisations have recently taken place in the London Aviation Co., Ltd., of 27 and 28, Charlotte Street, E.C.2. Mr. A. Montefiore has joined the Board of the Company as Chairman, Mr. A. H. Botwright retaining his position on the Board as heretofore. Under the new arrangement the outlook for the firm is distinctly promising, and it should contribute valuably to the output of aircraft.

The · Aeroplane ·

Acetylene Welding Plant—

Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—

Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation, Newcastle-on-Tyne."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2 City 7724.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.

Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."

Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."

Martinsyde, Ltd., Brooklands, Byfleet. Woking 331; Byfleet 171. "Martinsyde, Weybridge."

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455 "Nieuscout, Crickle, London."

Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."

The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. Putney 2240-2241, "Carbodis, London."

Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerfyta, Knights, London."

Waring & Gillow, Ltd., Hammersmith. Museum 5000. "Warisen, Ox, London."

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

White, J. Samuel, & Co., Ltd East Cowes. Cowes 3. "White, East Cowes."

Airships—

Airships, Ltd., High Street, Merton. Wimbledon 1314.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, 'Phone, London."

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Bizfibild, London."

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.

The Wilfley Co., Ltd., Salisbury House, London Wall, E.C.2 City 2681-2. "Wrathless, Phone, London."

Cable Coverings and Cable Controls—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Capstan Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Castings (Aluminium, Brass, Bronze, Machined or Rough)—

Coan, R. W., 219, Goswell Road, London, E.C.1 City 3846. "Krankases, Isling, London."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."

London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."

Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—

Accles & Pollock, Ltd. Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."

B. D. V. Aircraft Spares, Syon Chambers, 16a, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—

British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."

British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3022. "Ajawb, London."

Clarke, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Elastic Cords—

Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—

Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. Midland 981. "Fahrenheit, Birmingham."

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—

E. Kalker & Co., Coventry. Coventry 241 "Kalker, Coventry."

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford No. 1. "Pump, Bedford."

Arrol-Johnston, Ltd., Dumfries. Dumfries 281-182. "Mocar, Dumfries."

The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000.

Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. Gerrard 238. "Beardmore, London."

Dudbridge Iron Works, Ltd. (Salmson), 87, Victoria Street, London, S.W.1. Vic. 7026. "Aeroflight, Vic., London."

Gordon Watney & Co., Ltd., Weybridge. Weybridge 550 (7 lines). "Mercédès, Weybridge."

Green Engine Co., Ltd., Twickenham. Richmond 1203.

Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. Hammersmith 1910. "Gwynne, Hammersmith."

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sturtevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Moorfield, Wolverhampton."

The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W.. Walthamstow 408 (2 lines). "Elevenfold, London."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Flexible Shafts—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Flying Schools—

Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. Bournemouth 1160 "Etches, Winton."

Cambridge School of Flying & Aerodrome Co., Ltd., 30b, St. Andrews Street, Cambridge.

Galvanising—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Cowper-Coles Manufacturing Co., Sunbury-on-Thames. Sunbury 37.

Gears—

Moss Gear Co., Ltd., Thomas Street, Aston, Birmingham. East 407. "Mosgear, Birmingham."

Glue—

Improved Liquid Glues Co., Ltd., Gt. Hermitage Street, E. (Croid.). Avenue 3178. "Excroiden, Wapp, London."

Mendine Co., 8, Arthur Street, E.C. Bank 5873.

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines). "Comyn, Ching, Westcent, London."

Chas. P. Kinnell & Co., Ltd., 65 & 65a, Southwark Street, London, S.E.1. Hop 372 (2 lines). "Kinnell, London."

Instruments—

British Wright Co., Ltd., 33, Chancery Lane, W.C.2. Holborn 1308.

Instruments (Scientific, Altimeters, Speed and Pressure Gauges, etc.)—

Short & Mason, Ltd., Macdonald Road, Walthamstow, E.17. Walthamstow 180. "Aneroid," Phone, London

Machine Tools—

Brewster & Co., 11, Queen Victoria Street, E.C.4. City 768. "Circumfuse, Cannon, London."

Magneto Driving Pieces—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Magnetos—

The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. 1008-1009 Coventry. "Corlton, Coventry."

The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. Museum 430. "Vicksmag, Phone, London."

Metal Manufacturers—

Chas. Clifford & Sons, Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

Metals in General—

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

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Metal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."
Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."
Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2297.
Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041. "Bayliss, Wolverhampton."
The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow, London. Hounslow 254. "Golshel, Hounslow."
Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. Museum 70. "Installing, Eusroad, London."
Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261. "Fremo, Birmingham."
Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."
Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

Metal Shearing Tools—

Montgomery, Smith & Co., Ltd., Tangent Works, Keynsham, near Bristol. Keynsham 21. "Ingenuity, Salford."

Metal Spinnings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmiagham."

Metric Bolts—

Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

Miscellaneous—

Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."
Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C. Central 3731.
Bowdon Wire, Ltd., Willesden Junction. Willesden 2400 (3 lines). "Bowirelim, Harles, London."
Brown Bros., Ltd., Great Eastern Street, E.C.1. London Wall 6300. "Imbrowned, Bethroad, London."
Edison Swan Electric Co., Ponder's End. (Lamps). Enfield 520 (6 lines). "Ediswan, Enfield."
Herbert Frood Co., Ltd., Chapel-en-le-Frith. Central 793. "Frodobrake, Birmingham."
Glasso Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.
London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—

Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
Standard Motor Car Co., Coventry. Coventry 530 (4 lines). "Flywheel, Coventry."

Observation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Packers, Shippers, Etc.—

Lep Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depolep, London."

Patent Agents—

King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.
Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.
Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Petrol Storage (Bulk)—

Bywater & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. Gerrard 2220. "Bywaterist, London."

Piston Rings—

British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—

Bliss, E. W., Co., 2a, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissdon, London."

Presswork—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."
Integral Propeller Co., Ltd., Hendon 9. Kingsbury 104. "Aviprop, Hyde, London."
Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."
Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Stanley Aviation Co, 67, Kingsland Road, E.2. City 8347.
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—

C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. Chapeltown 474. "Instrument, Leeds."

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The Norman Thompson Flight Co., Ltd., Middleton, Bognor. Bognor 48. "Soaring, Bognor."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Short Bros., Rochester, Chatham 627. "Seaplanes, Rochester."
Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Shackles—

The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. Hounslow 254. "Golshel, Hounslow."

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.
Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sheet Metal Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Shock Absorbers (Elastic Cord)—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—

Forward Motor Co., Summer Row, Birmingham. Central 6259.
Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.
Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."
Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—

Dart Spring Co., West Bromwich. West Bromwich 322. "Dart, West Bromwich."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—

Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."
Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield"

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—

Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—

John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.
James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London"
R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."
The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Weskent."

Varnishes—

Clarke, R. Ingham, & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."
Harland, W., & Son, Merton. Wimbledon 45.
Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."
Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Washers—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Watchmakers and Jewellers (Silver Models)—

Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—

Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."
London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—

Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wiremill, Musselburgh."
Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Wirework—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Woodworking Machinery—

Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."
Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."
Wadkin & Co., Leicester. Leicester 3614. "Woodworker, Leicester."

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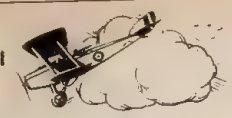


Acetylene Welding Plant—

Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—

Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation, Newcastle-on-Tyne."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2 City 7724.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1745.

Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420 "Hydrophid, Crickle, London."

Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."

Martinsyde, Ltd., Brooklands, Byfleet. Woking 331; Byfleet 171. "Martinsyde, Weybridge."

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6225.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455 "Nieuscout, Crickle, London."

Norman-Thompson Flight Co., Ltd., Bognor Bognor 48. "Soaring, Bognor."

The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. Putney 2249-2245. "Carbodis, London."

Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerlyte, Knights, London."

Waring & Gillow, Ltd., Hammersmith. Museum 5000. "Warisen, Or, London."

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

White, J. Samuel, & Co., Ltd East Cowes. Cowes 3. "White, East Cowes."

Airships—

Airships, Ltd., High Street, Merton. Wimbledon 1314.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, 'Phone, London."

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Binbibid, London."

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.

The Wulfley Co., Ltd., Salisbury House, London Wall, E.C.2 City 2681-2. "Wrathless, Phone, London."

Cable Coverings and Cable Controls—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Capstan Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Castings (Aluminium, Brass, Bronze, Machined or Rough)—

Coan, R. W., 219, Goswell Road, London, E.C.1 City 3846. "Krankases, Isling, London."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."

London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."

Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—

Accles & Pollock, Ltd. Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."

B. D. V. Aircraft Spares, Syon Chambers, 168, New Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—

British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."

British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3022. "Ajawb, London."

Clarke, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Elastic Cords—

Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—

Premier Electric Heaters, Ltd., 358, 359, and 360, Bradford Street, Birmingham. Midland 981. "Fahrenheit, Birmingham."

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—

E. Kalker & Co., Coventry, Coventry 242 "Kalker, Coventry."

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford No. 1. "Pump, Bedford."

Arrol-Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."

The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000.

Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. Gerrard 238. "Beardmore, London."

Dudbridge Iron Works, Ltd. (Salmson), 87, Victoria Street, London, S.W.1. Vic. 7026. "Aeroflight, Vic, London."

Gordon Watney & Co., Ltd, Weybridge. Weybridge 550 (7 lines). "Mercedes, Weybridge."

Green Engine Co., Ltd., Twickenham Richmond 1293.

Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. Hammersmith 1910. "Gwynne, Hammersmith."

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sturtevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Moorfield, Wolverhampton."

The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W.. Walthamstow 408 (2 lines). "Elevenfold, London."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Flexible Shafts—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Flying Schools—

Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. Bournemouth 1160 "Etches, Winton."

Cambridge School of Flying & Aerodrome Co., Ltd., 30b, St. Andrews Street, Cambridge.

Galvanising—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Cowper-Coles Manufacturing Co., Sunbury-on-Thames. Sunbury 37.

Gears—

Moss Gear Co., Ltd., Thomas Street, Aston, Birmingham. East 407. "Mosgear, Birmingham."

Glue—

Improved Liquid Glues Co., Ltd., Gt. Hermitage Street, E. (Croid.). Avenue 3178. "Excroiden, Wapp, London."

Mendine Co., 8, Arthur Street, E.C. Bank 5873.

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines). "Comyn, Ching, Westcent, London."

Chas. P. Kinnell & Co., Ltd., 65 & 65a, Southwark Street, London, S.E.1. Hop 372 (2 lines). "Kinnell, London."

Instruments—

British Wright Co., Ltd., 33, Chancery Lane, W.C.2. Holborn 1308

Instruments (Scientific, Altimeters, Speed and Pressure Gauges, etc.)—

Short & Mason, Ltd., Macdonald Road, Walthamstow, E.17. Walthamstow 180. "Aneroid," Phone, London

Machine Tools—

Brewster & Co., 11, Queen Victoria Street, E.C.4. City 768. "Circumfuse, Cannon, London."

Magneto Driving Pieces—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Magnetos—

The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. 1008-1009 Coventry "Corlton, Coventry."

The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. Museum 430. "Vicksmag, Phone, London."

Metal Manufacturers—

Chas. Clifford & Sons, Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

Metals in General—

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

Metal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."

Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."

Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2297.

Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041. "Bayliss, Wolverhampton."

The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow, London. Hounslow 254. "Golshel, Hounslow."

Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. Museum 70. "Installing, Eusroad, London."

Mountford, Fredk., Ltd., Fremo Works, Lilford, Birmingham Kings Norton 261. "Fremo, Birmingham."

Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."

Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."

Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

Metal Shearing Tools—

Montgomery, Smith & Co., Ltd., Tangent Works, Keynsham, near Bristol. Keynsham 21. "Ingenuity, Salford."

Metal Spinnings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Metric Bolts—

Cashmore Bros., Zeta Works, Hildreth Street, Balham, S.W. Battersea 415.

Miscellaneous—

Anderson, D., & Son, Ltd. (Rools), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."

Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C. Central 3731.

Bowdon Wire, Ltd., Willesden Junction, Willesden 2400 (3 lines). "Bowirelim, Harles, London."

Brown Bros., Ltd., Great Eastern Street, E.C.1. London Wall 6300. "Imbrowned, Bethroad, London."

Edison Swan Electric Co., Ponder's End. (Lamps). Enfield 520 (6 lines). "Ediswan, Enfield."

Herbert Frood Co., Ltd., Chapel-en-le-Frith, Central 793. "Frodobrake, Birmingham."

Glasso Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.

London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."

MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—

Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."

Standard Motor Car Co., Coventry. Coventry 530 (4 lines). "Flywheel, Coventry."

Observation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Packers, Shippers, Etc.—

Lep Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depolep, London."

Patent Agents—

King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.

Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.

Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Petrol Storage (Bulk)—

Bywater & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. Gerrard 2220. "Bywaterist, London."

Piston Rings—

British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—

Bliss, E. W., Co., 22, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissdon, London."

Presswork—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."

Integral Propeller Co., Ltd., Hendon 9, Kingsbury 104. "Aviprop, Hyde, London."

Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."

Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Stanley Aviation Co., 67, Kingsland Road, E.2. City 8347.

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—

C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. Chapeltown 474. "Instrument, Leeds."

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

The Norman Thompson Flight Co., Ltd., Middleton, Bognor Bognor 48. "Soaring, Bognor."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Short Bros., Rochester, Chatham 627. "Seaplanes, Rochester."

Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Shackles—

The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. Hounslow 254. "Golshel, Hounslow."

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497. Birmingham.

Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sheet Metal Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Shock Absorbers (Elastic Cord)—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—

Forward Motor Co., Summer Row, Birmingham. Central 6259.

Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."

Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—

Dart Spring Co., West Bromwich. West Bromwich 322 "Dart, West Bromwich."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—

Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."

Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield"

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—

Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lilford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—

John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London"

R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."

The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyrlcord, Westkent."

Varnishes—

Clarke, R. Ingham, & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Harland, W., & Son, Merton. Wimbledon 45.

Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."

Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Washers—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Watchmakers and Jewellers (Silver Models)—

Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—

Barlmar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."

London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—

Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wiremill, Musselburgh."

Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Wirework—

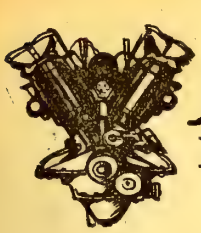
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Woodworking Machinery—

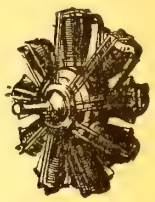
Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."

Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."

Wadkin & Co., Leicester. Leicester 3614. "Woodworker, Leicester."



AERO-MOTORS
IN KIND AND CONSTRUCTION



By Geoffrey de Holden-Stone

Tryers and Spinners.

Fortune the inconstant was ever fond of a good gambler; by whom I mean no trifler with tempting odds, but the man who, having picked his fancy, refuses to be put off, but backs it through thick and thin until it wins. That is the only man I have much use for, though the antis have none. But then none of us in England have any more use for the antis, so we shall break even at last.

Yet very early in that long ago, when I knew silk and snaffle better than sparking plugs, and only dealt with motors fourteen hands tall—though oft-persuaded to measure thirteen-two—I learnt that placing is the supreme art of racing. When you have something that can break seventy-five seconds against the watch with its shoes on, slip it in a selling plate. Then you can assuredly take any odds while you can find a layer. Whereas in the handicap over a distance you may just come undone by a short head. Especially when the stewards have backed the other.

How often, too, do you discover the real stayer in the supposed-to-be sprinter that was just not speedy enough?

In most of which respects I have found a motor to be very like a Mary Morrison. Just as much a thoroughbred, it is not all at once, or for many a careful trial, that you find out all about it, or the class it best belongs to on the running. But it is only the good gritful gambler of his time and talent who ever gets to know. Such a one as half-a-dozen men you know, for whom neither Whitehall nor Farnborough had any use, before the war.

Such a man, I fully believe, is Mr. E. C. Chadderton. Therefore, since we are getting very sick of the official stumers, it is the more interesting to see how his second effort with his motor in the radial class is likely to run; especially since his original cycle-purpose is unchanged. How original—in the better sense—it was and is, and how much closer is its breeding to military needs than the half-breds and cocktails of convention and imitation, I have already said. Merely as my own opinion.

Let us then examine the illustrated evidence, as there is no form to go upon so far.

Detail Changes.

That channel-shaped collar-valve was, after all, a queer kind of bit, though I, for one, had little doubt of its reliability. But to make sure, Mr. Chadderton has substituted another, of the conical disc pattern, mounted in a seating screwed into the head of the outer piston and having its short thick stem attached to a lever with a roller on the free end working in a cam slot and hardened steel pocket on one side of the cylinder-top.

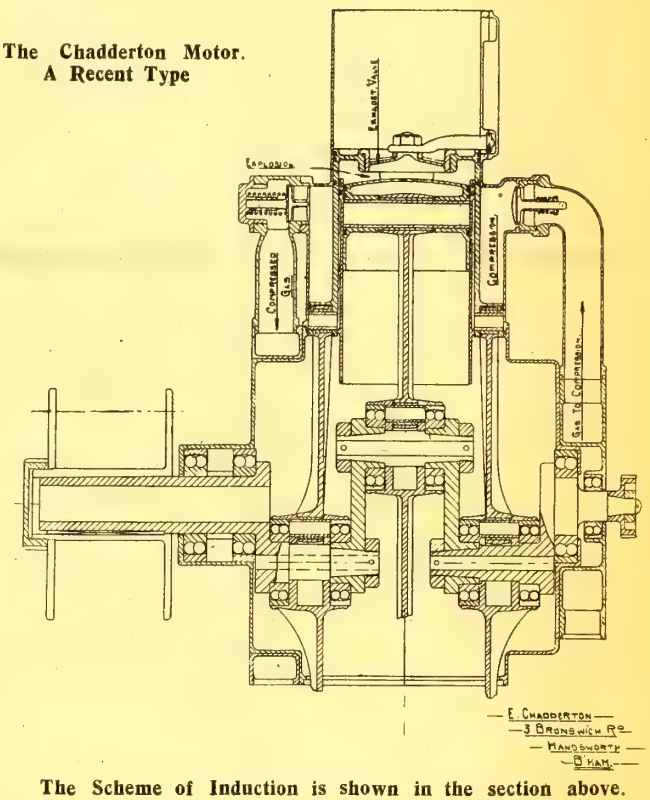
This device is new enough—to my experience at least—and simple enough. It is clearly capable of free working attachment, as the compression will seat it tightly. The lever has extremely little work to do, so however exposed it may be to the hot gases, it should not distort. Trial only can show. There may be, I venture to suggest, another and more effective way of doing the same thing. But in any case, there is so little actual mechanism—none whatever needing extraneous operation—that in its most essential function the motor is all but as good as valveless. So much may be reasonably conceded.

Then it will be readily apparent that the crankshaft has been very soundly and very commercially designed—out of bits and pieces of readily tested steel, with the grain all going the right way—and coming to an easy and true assembly. There are no cotter bolts. So it is evident that the connecting rod big ends are in the form of alternate hooks and hooked prongs—hook within prong—as to their attachment round the crank-pin; their upper shoulder-like segments serving to house the ball-races. So that in assembly the slipping on the crank-webs over the male cones of the pin and under the ball-races, serves for the final lock-up when the nuts are set home. These nuts are also pinned through; but it may be suggested that they should be deeply grooved round their circumference, so as to hold the essential S-like wiring in stout brass that is more reliable than any split-pin. Altogether a very pretty assembly-device; not only simpler, but incidentally stronger than any of the Continental ingenuities.

Some Advantages: and a Novelty.

It need hardly be pointed out that in a radial proposition like this the crankshaft is absolutely floated by the opposed motion of the pistons, inner and outer: and the ideal of the—S—scheme of design thus realised, including the elimination of all tendency to knock as well as wear upon the journal bearings, which are actually quadrupled fore and aft.

The Chadderton Motor. A Recent Type



The Scheme of Induction is shown in the section above.

Now we come to the real novelty of the design. Mr. Chadderton, realising that his original model was more than a little "on the leg" as a rotary or a radial, has also sought, like a wise trainer, to make it crouch to its thirteen-two or less: that is within a total diameter of 36 inches between cylinder tops. Withal, while keeping an effective stride of an eight-inch expansion for the four-inch stroke of each piston. And here—more strongly than ever—do we note the apparent paradox of the piston-within-piston scheme of design; in that it is all done on a crank-throw of merely two inches between journal and crank-pin centres. Some power-stride, and explosion efficiency pulling to the very end, considering that the bore is 4½ inches in this particular model.

And there is no pin-and-cork business about this result either. The Chadderton permanent lead-pad takes the form of an intermediate stationary sleeve between the pistons, which is supported by a flange at its base that fits into a recess in the periphery of the crank-chamber. In the illustration, it seems to float loosely, or be attached in some way to the heads of the outer connecting rods. Actually, the flange is slotted out at the sides to clear the latter at full instroke of the outer piston; the position shown.

The Working Result of It.

Now it will be seen that the immediate effect of this sleeve-interposition is to shorten the length of the outer piston, which, not being now required to contain, and serve as a slide for, the inner one, need have no greater length than its own actual stroke, having plenty of sliding space of its own within the outer cylinder or shell. At the same time, the sleeve acts as a slide and container for the inner piston.

Thus the whole motor can be, and is, shortened by the exact length of the stroke of either piston; i.e., four inches. That being so, how much is saved of the original amount of friction? It was—or would have been—the full eight inches of the outer piston's surface, four for its stroke and four for its content of the inner one. And then four more for the surface-and-stroke-length of the latter. Now, with this intermediate sleeve, we have the stroke-surface-length of the outer piston, four inches. As many more, for the outer surface of the sleeve. And then, naturally as much again for the inner surface of the

sleeve and the stroke-length surface of the inner piston. Total, sixteen linear inches of surface in friction, as against twelve. So that instead of friction being reduced, as claimed, it is clearly actually increased by a third! Lubricant consumption will hardly be reduced by the change: but the saving in motor height is well worth it.

The Question of Balance.

The next point to note is that of mechanical balance. The length of the outer piston—and hence its weight, is reduced by one-third: which leaves it still twice the length of the inner piston. On the other hand, each of its two rods must be four inches longer, giving at least two-thirds of a rod's weight above the weight of the central rod moving always in opposition to them. Whereas previously, the weight of the pair should have just balanced that of the middle one, which is now proportionately shortened.

What to do then? Except by strengthening the combustion head of the outer piston—which means more metal, however fine and strong it may be—you cannot cut much weight out of its shell or trunk. Thanks to that intermediate sleeve, nevertheless, it can now be skeletonised over the lever four inches of that trunk to a lattice or lace-work: which alone will reduce friction as well as weight. But even so, it will hardly be got down below the weight of the inner piston, for the margin of reduction on the one side is slotting *plus* thinning against actual thickening of the inner piston's metal: and then there is the weight of that extra two-thirds of a rod.

All this, therefore, to show that complete mechanical balance in the unit of this or any piston-within-piston design, is all but unattainable. Some percentage of wear—however reduced—must occur on the bearings despite the absolute balance of explosion shocks. The perfect balance, therefore, can only be looked for, from the opposition—direct or *en V*—of a similar unit.

The New Cycle: How it Works.

Follow now the examination of the charging cycle: in my opinion clearer, and far more assured of fulfilling the excellent and wholly original Chadderton ideal of mixture injection at the last moment. If now we look at the rear end of the crank-chamber mass, we shall notice an annular induction ring—similar to that of the Anzani, with a throttling sleeve at the bottom right-hand corner, to control the amount of air admitted. For this ring is nothing more than a collector for each of the air induction pipes above, through which—notice the arrow—the air is sucked in through the a.o. valve—right-hand top corner—by the differential part of the outer piston.

Here it should be said that this compression volume is purposely made much greater than is actually required to fill each cylinder—by about 20 per cent. at a rough estimate—at low altitudes, with the idea of getting just that excess margin for the whole set that at high altitudes the rarefaction of the atmosphere will not affect the full charging, and hence the efficiency of the motor.

Which is quite excellent, so far as it goes. But it is not more the actual rarefaction, than the chemical composition of the air at high altitudes which makes the trouble. Still, the distinct advance of the Chadderton inception is manifest.

Then, compressed, the air is driven through the other a.o. non-return valve—top left-hand corner—and thence downward into a similar annular collector on the front side. From this it passes through a pipe to an air container—"bottle"—from which the excess volume of air can be fed by separate pipes to two or three of the cylinders for automatic starting.

It will also be seen that this gives air-cooling under the shortest of forced draught.

The automatic starting, however, is merely a useful side-show of the cycle. The main further issue is that the air now passes, at a pressure of some 75 lbs., through a carburetting device: from which it then continues—as an appropriately proportional mixture to each combustion chamber in turn—marked A—as soon as the exhaust valve has closed, at the moment previous to firing.

And that is all there is to it, descriptively. The inventor suggests that the cycle goes "a long way round" to its result. Frankly, I disagree. He has set himself an ideal—and to my mind a most valuable one—and I do not see off-hand how he could have realised it more simply. Nor do I see that it is any more "lengthy"—it is certainly not more complicated—than the average conventional way of direct carburation; or than even the classic fuel injection method of which the Antoinette is the example best known to aviation.

There may be an easier mechanical way of doing the same thing: just as there may be a better fruit than a strawberry. But despite Luther Burbank, the strawberry is there. So is the Chadderton design. In my opinion it seems to have arrived clearly enough. The only "ifs" are the reliability of those a.o. inlet valves—pressure-balanced after all—and the special carburettor. If Mr. Chadderton has got—or can get—the latter right—and it will have to be something very special and different, entailing a lot of calculation as to how small to get its choke tube and trunk—I do not see why this motor should not go a long way in aviation.

(To be continued.)

Market Affairs.

August 16th, 1917.

GOVERNMENT CONTROL.—A report has just been presented by the Merchants' Committee of the London Chamber of Commerce to the Premier, and other Government Departments. Many of their statements corroborate the remarks contained in the Market Report which appeared in The Aeroplane of August 1st. The report is too long to be given in detail, but for the benefit of readers several important extracts are given below.

(1) The policy at present pursued appears to be based upon an imperfect appreciation of the principles upon which the import business of the country has been conducted, and of the means by which the natural resources of the country itself have been rendered serviceable for the needs of industry, whether carried on by the State or by private enterprise, separately, or in alliance with the State. It is only in comparatively recent times—outside the Ministry of Munitions—that the direct employment of trained business men has been availed of to any extent by the Government. The action of Controllers has in many cases conduced to high prices and ultimate scarcity.

The following recommendations are made:—

(a) That the Government should cease to act as trading intermediary between producers and consumers, but should utilise to the fullest extent the services of the business community.

(b) That to this end merchants should be encouraged to continue to carry or import stocks of commodities essential to this country.

(c) That so far as any control of imports and exports is concerned, the quantities allowed should as far as possible be based upon a fair allocation of quantities amongst merchants dealing in particular articles, after consultation with representative trade organisations. Permits should only be granted to British and Allied subjects who are legitimate merchants and importers in the trade involved.

(d) That the various Control Departments should be co-ordinated so far as to secure a uniform system on questions of principle and to obviate present delays in dealings with licenses and permits.

(e) That Control Departments should in all cases be assisted by representative business men nominated by their respective trades.

(f) That steps be taken to represent to the Government, to Members of Parliament, and the public generally, the views set out in the Report of this Committee.

A special appendix is added to the Report showing the unsatisfactory results of the Government interference in the Timber trade.

The Timber trade is one which has had exceptional experiences of the unsatisfactory results of Government intervention in a business where technical knowledge is a first consideration. At an early stage of the war the services of the Timber Trade Federation of the United Kingdom were offered to the Government, but were not accepted, when the War Office turned over to the Office of Works the great undertaking of providing buildings, hutments, etc., for the new Army. A Government buyer was appointed, with the result that f.o.b. prices appreciated, and incidentally the German Government declared wood contraband. The Timber trade consider that had they been consulted by the Office of Works at an early stage, they would have enabled the Government to purchase their large requirements on a more economical basis.

The appointment of a Controller of Imports generally was undoubtedly necessary in view of the tonnage question, but this official omitted to ask the advice of the trade, and considerable surprise was expressed when one of the most important items required by the War Office for buildings, etc., was prohibited, viz., planed or dressed boards, floorings, and matchwoods.

The prohibition, however, was eventually withdrawn, after having created serious difficulties, necessitating in some instances the discharge of such goods already loaded in steamers, apart from the undue appreciation of prices which occurred through the temporary stoppage of supplies.

The next step taken by the Government was the appointment of a Controller for Timber Supplies. The gentleman placed in the position was a distinguished Indian Official, who invited the Federation to nominate a few of its members to serve on an Advisory Committee, reserving to himself the

right to appoint two or three others at his discretion. This was a move in the right direction, and the Timber trade regret that the Office of Works did not do likewise in the initial stages of the war. It must, however, be added that the Advisory Committee have expressed themselves as being dissatisfied with their *locus standi*; official orders are issued without reference to them, and become accomplished facts before they had the opportunity of discussing them. They also complain that minor officials have been appointed by the Controller without asking the advice of the Committee, including men of military age, when there were a large number over age, with greater experience, who would have filled the positions quite efficiently.

The action taken by the Controller in prohibiting the import of Timber in the early months of the year, together with the restriction on spot prices, has had the unfortunate effect of preventing importers from contracting for supplies from Norway and South Sweden, when it was of the utmost importance that Timber should be attracted here to fill up seriously depleted stocks. When, however, the Department appreciated the position, instead of giving importers a free hand, though confining them to a maximum percentage of profit, they publicly announced that merchants were permitted to import and sell at a price not exceeding 33⅓ per cent. on prices ruling on January 31st, 1917; the result of which was to stiffen the backs of shippers who were at that moment disposed to ease their f.o.b. prices. In view of the submarine menace, and Germany have virtually withdrawn the arrangement with Sweden, insurances and freights became abnormal, so that this permission became more or less a dead letter, and merchants' holdings were reduced to a level hitherto unknown in the history of the trade.

Recently, powers were given to the Controller to commandeer approximately all the Timber stocks in the country, with the result that the merchants' business has, for all practical purposes, become moribund. An army of officials has been created to carry out the distribution of these stocks, which might well have been done by merchants on behalf of the department, with the staff and machinery at their disposal.

The results of the inquiries made by the London Chamber of Commerce confirm the statements which have been made in this paper from time to time, and, although the appendix on Timber refers to softwoods, we see that official interference invariably ends in "Excessive Prices, Shortage of Supplies, Avoidable Muddle," and, more serious still, "Impeded Output."

In view of the herculean effort to be made in order to increase the output of war materials, one thinks it is time the Government removed some of the restrictions which are seriously impeding output.

MARKET REPORTS.

Prices are for quantities on usual terms.

COPPER.—The whole position appears to be in a state of chaos. The United States Commission do not appear to be profiting by the serious mistakes made by our officials, and it is quite apparent that U.S.A. Copper producers are anything but satisfied with the prices fixed. The labour problem in the States is still very serious, and no satisfactory solution appears to have been evolved. Fortunately, there are ample supplies. The prices here are unchanged, although it is felt that the labour trouble in U.S.A. will result in authorities here being compelled to make a still further reduction in prices.

Current Prices.

Standard Copper	£125 per ton, cash.
Copper Sheets	160 per ton.
Copper Tubes, S.D.	19⅜d. per lb.
Brass Sheet, 24 Gauge	15⅝d. per lb.
Brass Tubes, S.D.	16½d. per lb.

TIN.—Since the last report there has been a very sharp decline in prices. This may only be temporary. At the same time, it proves that the erratic condition on the market has not yet come to an end. Upon reference to the comparison of prices it will be observed that the decline has brought the market to the level it had reached just over a year ago.

U.S.A. consumption is increasing, and consumers there are making pretty large purchases from the East.

Comparative Prices.

To-day, August 15th	£244 0 0
August 13th	242 10 0
August 9th	247 0 0
Last Week	245 10 0
July, 1917	242 15 0

STEEL.—As stated previously, many of the works were closed all Bank Holiday week, but are now in full swing again, and it is generally expected that by the end of 1917 there will be a very appreciable increase in the output of all classes of Steel, particularly Aircraft Steels.

The control of Steel is very strict indeed, and it is now impossible to obtain supplies for anything but direct Government work. Prices are still unchanged, and there does not appear to be any indication that they will be altered at present.

Current Average Prices.

R.A.F. 3B	Steel, 36s. to 40s. per cwt., Basis. (Black or Blue Reeled).
R.A.F. 1E	Steel, 78s. to 80s. per cwt., Basis. (Black or Blue Reeled).
R.A.F. 9A	Sheet Steel, 30s. to 32s. per cwt.

ALUMINIUM.—The position is still unchanged, and supplies are still very good.

Official Prices.

Ingot	£225 per ton.
Remelted	210 per ton.

LEAD.—The chief concern at present is the question of supplies, and this is being influenced chiefly by the labour difficulties. The situation being far from satisfactory, in fact, there are indications that the trouble will spread.

Prices still remain unchanged.

Official Price..... £30 10s. to £29 10s.

TIMBER—The Timber market is in a very bad way indeed, and question of supplies is most serious. It is now generally agreed that only 20 per cent. of the Timber imported by the Admiralty is suitable for aircraft works. Walnut is very scarce indeed, and there are only a few shipments of Mahogany being received. Shipments of Silver Spruce are as scarce as sovereigns. During week ending August 8th, one shipment only appears to have been received.

One is anxious to see what steps the Air Board intend taking in order to procure very large supplies of Timber to enable factories to substantially increase their outputs.

Prices are very unsettled, but the tendency is upward.

Current Average Prices.

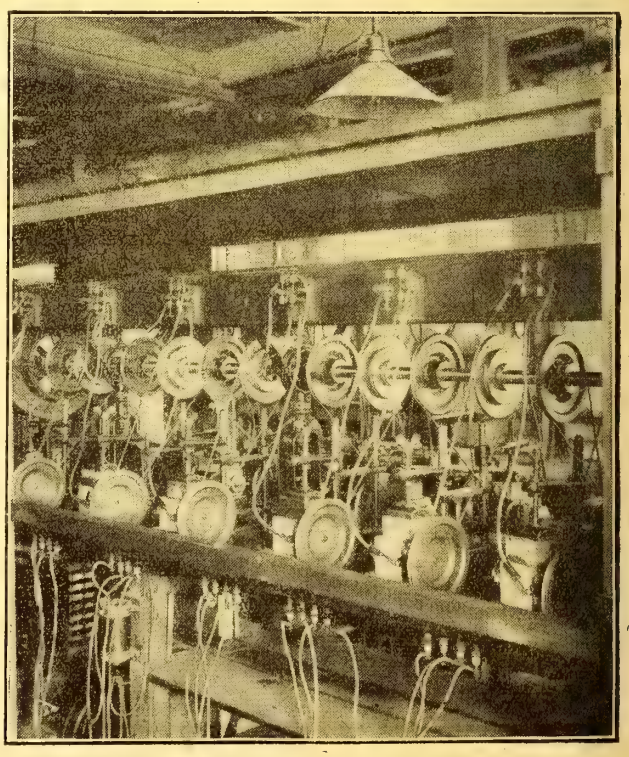
Silver Spruce, 17s. to 18s., c.f.
English Ash, 13s. 6d. to 15s., c.f.
Walnut, 2s. 3d. to 2s. 6d., s.f.
Mahogany, 2s. to 2s. 4d., s.f.

Prices include selection and delivery.

FABRIC.—One is informed that the official price for Fabric is 2s. 8d., 36 in. wide.

One can only say that the price is, to put it mildly, atrocious, and confirms the statement of the London Chamber of Commerce, viz.: "The action of Controllers has in many cases conduced to high price."

The average price of 17C Cloth, before the material came under Air Board Control, was 1s. 11d. to 2s., 36 in. wide. One is quite aware the price of Flax was on the increase. At the same time, one has excellent authority for stating that if a competitive market were still in existence, the highest possible price would be 2s. 3d. per yard, 36 in. wide.



AT THE B.L.I.C. MAGNETO WORKS.—Some of the test benches.

THE PATENTS INDEX.

The subjoined list of recent inventions has been specially compiled by The Aeroplane from the current Official Patents Records.

Patent Applications.

Barrett, A. W. Inclinometer for aircraft. No. 11432. August 9th.

Blackburn Aeroplane and Motor Co. Hulls or floats for hydroplanes. No. 11328. August 7th.

Brooks, C. H. Inclination and level indicators for aircraft, ships, etc. No. 11491. August 10th.

Brown, H. C. Lamps or lanterns for aircraft. No. 11389. August 8th.

Flower, S. A. Transverse frames of airships. No. 11540. August 10th.

Homer, E. Angle-indicator for use on aircraft. No. 11381. August 8th.

Massey, C. W. Aircraft bomb. No. 11429. August 9th.

Motte, R. C. Bodies of aeroplanes, seaplanes, boats, floats, etc. No. 11375. August 8th.

Murray, J. J. Aeroplanes. No. 11416. August 8th.

Searls, C. M. Wood-shaping machine for aeronautical propellers. No. 11438. August 9th.

Smiles, M. G., and others. Sparking-control of aviation engines. No. 11544. August 10th.

Smith, W. T. Aerial machines. No. 11582. August 9th.

Soc. Lorraine des Anciens Etblmts.; de Dietrich et Cie., Luneville. Speed-reducing gear for aviation engines. No. 11456. August 9th.

Soc. Lorraine des Anciens Etblmts.; de Dietrich et Cie., Luneville. Ignition apparatus for aviation engines. No. 11457. August 9th.

Tattersall, S. Aeroplane, airship, and tractor propeller. No. 11367. August 8th.

Williams, F. W. R. Safety appliances for aeroplanes. No. 11560. August 11th.

Wood, E. R. Means of controlling aeroplanes on alighting or in event of their falling to earth. No. 11327. August 7th.

Complete Specifications Accepted, Prints of which are obtainable on and after August 30th, 1917.

108,364. August 9th, 1916. Croxon, W. Parachutes.

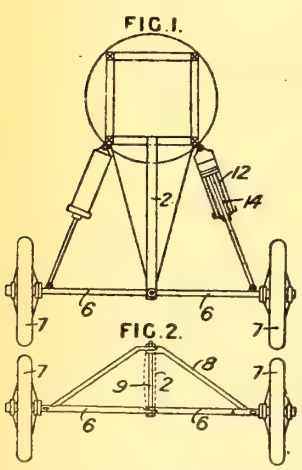
108,383. September 12th, 1916. Smith, A. E. Laminated aeropropellers.

108,405. October 23rd, 1916. Robinson, P., and Airey, E. Aeroplane hangars.

108,419. December 12th, 1916. Curtiss, C. H. Helmets for aviators and the like.

108,423. August 26th, 1916. Quaglia, G., and Capello, A. Conection of lengths of wires with hooks, tightening devices, and other members.

Abridgments of recently published Specifications.

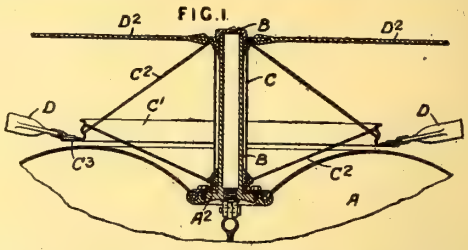


107,009. Aeronautics. Vedrines, J., 33, Rue Notre Dame de Lorette, Paris, and Astoux, L. L., 35, Avenue des Moulineaux, Issy (Seine), France. May 29th, 1917, No. 7698. Convention date, May 29th, 1916. Not yet accepted. Abridged as open to inspection under Sect. 91 of the Act. (Class 4.)

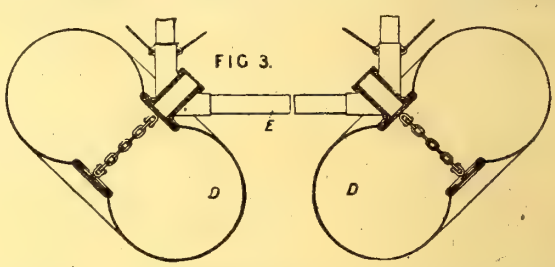
Land Wheels; Shock of Landing, deadening. — The wheels 7 of an aeroplane are carried by a single or divided axle 6 pivoted at the centre to a vertical web 2 braced to the fuselage, the outer ends of the axle being connected to the fuselage through shock-absorbers 12. The axle 6, shown divided in Fig. 2, and rearward bracing-members 8, are pivoted in notches in the web 2 by a long bolt 9. The shock-absorbers comprise pistons and cylinders with rubber or coil-spring tension members 14.

107,050. Pneumatic Springs; Aircraft. Sloper, T., Southgate, Devizes, Wiltshire. June 12th, 1916, No. 8306. [Classes 4 and 108 (iii).]

Relates to means for mounting air-cushions for aircraft of the kind described in Specification 105,977. According to the invention, the air-cushion is rotatably mounted on a support, the axis of rotation being perpendicular to the side of the cushion whereby it is secured to the support. As shown in Fig. 1, the plate A^2 of the cushion A is provided with a hollow spindle B rotatably mounted in the hub C of a wire wheel provided with spokes C^2 and a rim C^1. The rim C^1 is preferably L-shaped to provide a flange C^3 to which radial struts D and tangential ties, secured at the other ends to the aircraft, are attached. Ties D^2 may be



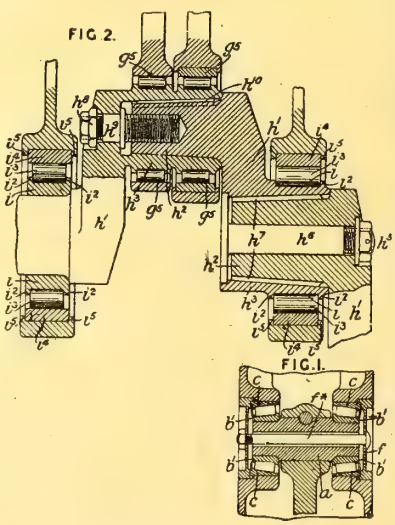
provided to prevent the hub C from tilting. The cushion A may be provided with an external annular plate to prevent abrasion by the flange C^3. The axis of rotation may be arranged at an angle to the aircraft, and more than one cushioning-device D may be provided on one frame E, as shown in Fig. 3. In a modification, the wheel is arranged to rotate with the air-cushion, the rim serving as a support for the cushion when under load.



According to the Provisional Specification, the rotatatable mounting may be dispensed with, the wheel and the cushion being fixed with regard to the aircraft, the cushion may be secured to the periphery of the wheel, and the struts D may be hinged onto the wheel.

107,052. Crank-shafts; Bearings. Orville, T. L. R. d', formerly 241, Addison Way, Golders Green, London, now Cross Deep Lodge, Twickenham, Middlesex. June 13th, 1916. No. 8343. [Classes 12 (i), 12 (ii), 80 (ii), and 122 (i).]

In an aeronautical or other internal-combustion engine, the small and big ends of conecting-rods and the crank-shaft bearings are provided with anti-friction rollers, and a built-up crank-shaft is employed. The latter, as shown in Fig. 2, consists of **Z** sections fitting into one another, each section consisting of a web h^1, which may be milled to **H** section, and a conical pin h^2, and an internally conical sleeve h^3. The engaging parts which form the crank-pins are drawn together by screws and nuts h^9, h^8 and are locked by keys h^{10}, while the portions forming the crank-shaft journals are formed with engaging ribs and recesses h^7, and are drawn together by bolts and nuts h^6, h^5. The inner races i for the rollers i^3 of the crank-shaft bearings may be formed in the crank-shaft, or may be separate, and formed with retaining flanges i^2. The outer races i^4 are secured in the crank-casing by retaining flanges i^5. One pair of bearings may be fitted with tapered rollers. The bearings for the big ends of the connecting-rods are similarly formed, the inner races being formed in the crank-pin, and the outer races g^5 either formed in the connecting-rod ends or detached. The gudgeon *a*, Fig. 1, is formed with reduced ends which are supported in roller bearings inclined either outwards, as shown, or towards the centre. The rollers also are formed tapered and are grooved at one end to receive retaining flanges b^1 on the inner races, which may be formed in the gudgeon or separate as shown. The inner races may be adjustable by nuts screwing into the gudgeon, or, as shown, the outer races *c* may be adjustable by cups *f* screwed into the piston or drawn together

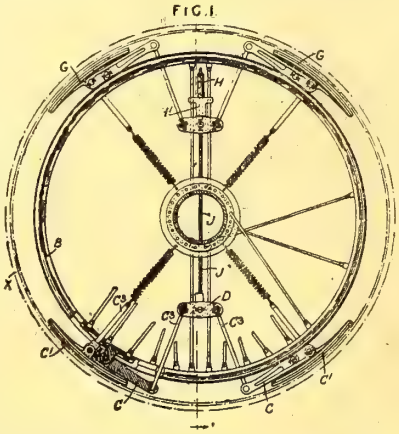


by a bolt *f** passing through the hollow gudgeon. The spaces enclosed by the cups *f* may be supplied with oil for lubricating and cooling.

107,051. Brakes. Sloper, T., Southgate, Devizes, Wiltshire. June 12th, 1916, No. 8307. [Classes 80 (iii) and 103 (i).]

Relates to Bowden-wire brake-mechanism in which the wire is laid in a curved path, and is so arranged that the wire and casing of the wire each operate separate brakes. The brakes are mounted on the circumference of a fixed wheel-like support. In the form shown, four brakes C^1, G are mounted on opposite sides of a wire-spoked, fixed wheel B of the type described in Specification 15086/15. The pull of the wire J operates the brakes C^1 through a sliding yoke D, links C^3 and levers C, and the thrust of the casting H operates the brakes G through a slide H^1, links, and levers. The brakes operate on the inside of a drum X which may be carried by the wheel of an aeroplane. In this example, the end of the casing H at the operator's end is fixed, and the movement of the slide H^1 is due to the tendency of the casing to assume a straight line when the wire J is pulled. The pull-wire may be held stationary at the operator's end and the casing moved, or both wire and casing may be moved in opposite directions.

FIG. 1.



107,099. Aeronautics. Wilson, T. E. C., Glenwyllin, Waterloo Park, Liverpool. July 17th, 1916, No. 9995. [Classes 4 and 9 (ii).]

Aerial Machines without Aerostats; Planes, construction and arrangement of; Propelling; Steering and Balancing.—A biplane is provided with rearwardly-extending surfaces 3 covering the top of the fuselage, the sides 4, 5 of which also are covered thereby forming an inverted conduit through which the air passes. The bottom of the fuselage may be covered. A propeller 12 is provided at the front end of the conduit, and one or more elevators 7 at the rear end. Side propellers 13 are provided; these may be driven by the same engine as the propeller 12 or by a separate engine. Clutches and variable-speed gear are provided for regulating the speeds of the propellers 13, or stopping one of them, for steering. Helicopters may be fitted.

FIG. 1.

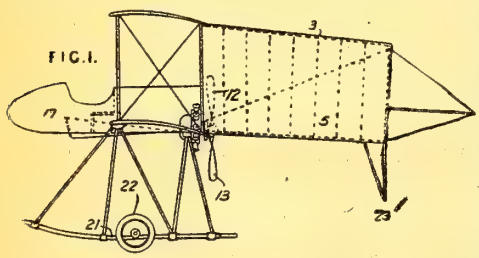
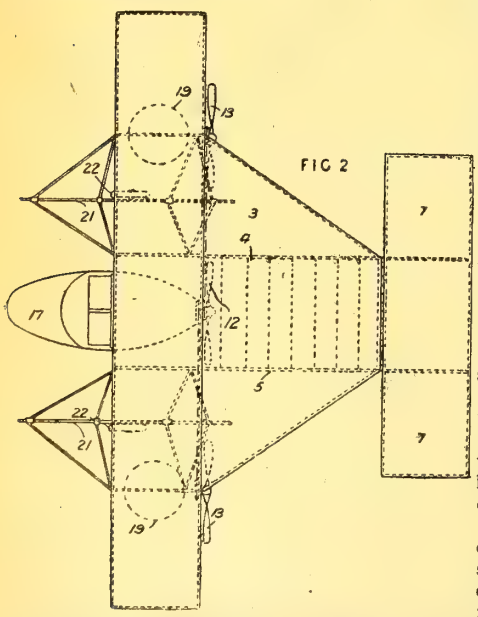


FIG 2

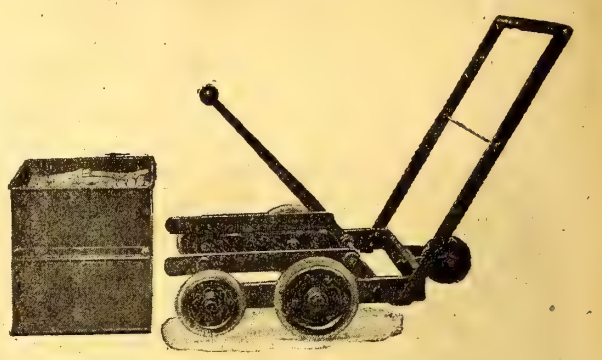


Cars and Cabins; Aerial Warfare.—The body 17 carrying the pilot's seat is mounted on the lower plane, and two gun mountings 19 may be arranged between the upper and lower planes for operation by two observers.

Land Wheels, Runners, and Skids; Floats, arrangement of.—Skids 21 with wheels 22, and tail-skids 23, may be provided as shown. The skids 21 may be provided with floats of cork, etc.

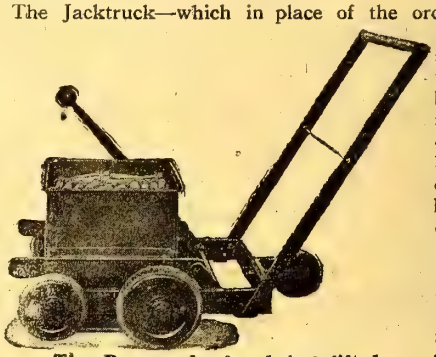
A USEFUL ACCESSORY.

Works superintendents and others will be interested in the "U"-Frame Jacktruck, which is designed for rapid transveying work in machine shops and warehouses or wherever articles are collected in boxes. It is exceedingly simple both in design and in use.



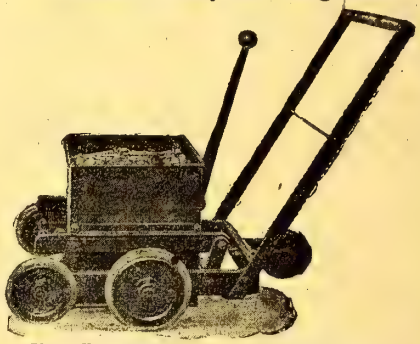
The Box and Jacktruck ready for use.

The Jacktruck—which in place of the ordinary platform has a frame with "U"-shaped jaws — is wheeled up to the box; the jaws pass under two battens on the sides of the box and then the operation of a hand lever lifts the latter off the ground; the Jacktruck with the box is now easily wheeled to any weighing machine, gauging room, packing room or other spot where required.



The Box ready for being lifted.

The Jacktruck will turn round either way in its own length and can easily be pushed in and out of awkward places. It is of metal and the wheels are fitted with roller bearings. All parts are standardised, and it can be built in any size to suit boxes up to two feet wide.



The Box lifted off the ground ready for transportation.

It is claimed by the makers—Messrs. J. T. Hardaker, Ltd., of Bowling Ironworks, Bradford—that one "U"-Frame Jacktruck with 30 boxes is as efficient as 30 ordinary transveying trucks—of course, at far less cost.

AIRCRAFT SPORTS.

The first annual sports of the Handley Page Athletic and Social Club are to be held at Avenue Grounds, Cricklewood Lane, on Saturday, August 25th, at 2.30 p.m. Among the items on the programme are a few open events, confined to aircraft workers in Hendon and Cricklewood districts, other than members of the H.P. Club. The firm has always encouraged sports of all kinds, and is again giving practical encouragement by generously providing all the prizes free of cost. Mr. F. Handley Page has kindly consented to present the prizes. For entry forms and further information apply to W. H. Jones, hon. gen. secretary, 12, Olive Road, Cricklewood, or tickets may be obtained from any employee of Handley Page, Ltd.

AIRCRAFT FITTINGS.

In a recent issue of The Aeroplane it was stated that the Albany Forge, Ltd., is in association with Whiteside and Caslake. It is, however, pointed out that the Aviation Department of the Albany Forge, Ltd., is entirely under the control of Mr. W. Lovelace-Osborne and is not in connection with the firm afore-mentioned. The Aircraft Department, which is situated at 45, Goldhawk Road, Shepherds Bush, W.12, is concerned entirely with aeronautical engineering and is prepared to take on contracts for any parts of aircraft.

Continued from page 510.

Ross-Soden, Sec. Lt. G., R.F.C.
Wharram, Sec. Lt. C. E., S. Staff. R., attd. R.F.C.

MISSING.—Bedson, Capt. E. H., Lan. Fus. and R.F.C.
Billings, Sec. Lt. H. B., R.F.C.
Fulton, Sec. Lt. E. P., R.F.C.
Howes, Lt. W. H., R.F.C.
Skinner, Sec. Lt. W. R. K., R.F.C.

CANADIAN CONTINGENT.—ACCIDENTALLY KILLED.—Hanlan, Lt. E. G., Cent. Ont. Regt., attd. R.F.C.

WOUNDED.—Short, Lt. S. H., F.A., attd. R.F.C.

MISSING.—Bean, Lt. C. A. S., B.C. Regt., attd. R.F.C.

* * *

CASUALTIES AMONG WARRANT OFFICERS, N.C.O.'s, AND MEN OF THE R.F.C. The dates are those of the official list:

KILLED.—AUG. 7th.—Brett, 46685 Cpl. S. (Warburton).

AUG. 8th.—Burlinson 51128 2nd Cl. Air Mech. F. (Bromley); Mee 56486 2nd Cl. Air Mech. J. (Derby); Shaw 5083 1st Cl. Air Mech. R. (Bootle, Liverpool).

PREVIOUSLY REPORTED WOUNDED, NOW REPORTED DIED OF WOUNDS.—AUG. 10th.—Thomas, P/9018 2nd Cl. Air Mech. C. B. (Ash, Kent).

DIED.—AUG. 8th.—McVie 36478 2nd Cl. Air Mech. W. (Blackburn).

WOUNDED.—AUG. 6th.—Kay 48141 Sgt. R. (Lytham).

AUG. 7th.—Bay 58168 2nd Cl. Air Mech. A. G. (Barnsbury, N.); Booth 12004 2nd Cl. Air Mech. F. (Claughton); Bowen 8611 1st Cl. Air Mech. C. C. (Newcastle); Clarricoats 58293 2nd Cl. Air Mech. J. (Clapham Road, S.W.); Dockery 48758 2nd Cl. Air Mech. T. (Childs Hill, N.W.); French 65036 2nd Cl. Air Mech. S. C. (Clapham, S.W.); Hobbs 45215 2nd Cl. Air Mech. H. C. (Bromley); Jones 10554 2nd Cl. Air Mech H. A. R. (Maidstone); Kington 49908 2nd Cl. Air Mech. G. V. (Worcester); Knight 10398 2nd Cl. Air Mech. W. A. (Camberwell, S.E.); Miles 7996 1st Cl. Air Mech. F. (Cheltenham); Simonsen 65069 2nd Cl. Air Mech. T. C. (West Dulwich, S.E.); Stowe 43976 2nd Cl. Air Mech. A. E. (Smethwick).

AUG. 8th.—Beerling 12453 1st Cl. Air Mech. J. J. (East Ham, E.); Simpson 44698 2nd Cl. Air Mech. A. J. (Earls Barton); Watson 65385 2nd Cl. Air Mech. H. (Thornton)

AUG. 9th.—Hobbs 45215 2nd Cl. Air Mech. H. C. (Bromley); Lovegrove 53684 3rd Cl. Air Mech. F. W. (Finsbury Park, N.).

AUG. 10th.—Stevens 12459 Cpl. T. (South Molton St., W.).

AUG. 11th.—Tibbles 79087 2nd Cl. Air Mech. A. (Kentish Town, N.W.).

MISSING.—AUG. 6th.—Carr 65251 Cpl. J. F. (South Sheilds); Harris P/4511 2nd Cl. Air Mech. W. (Ironville); Walker 6757 Sgt. T. (Barwick-in-Elmet).

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS OF WAR.—AUG. 11th.—Tyrrell 47292 2nd Cl. Air Mech. R. (Gunnersbury, W.).

CAVALRY SPECIAL RESERVE, attd. R.F.C.—Blakes 1128 W. G. (Ballymena).

PERSONAL NOTICES.

DEATHS.

BAILEY.—Writing to the father of Sec. Lt. Clive Maxwell Bailey, R.F.C., whose death was announced last week, his C.O. says:—"Your son will be remembered in this squadron as one of the keenest and most enterprising of our pilots. He was always ready and anxious to fly, and when flying to improve himself by all means in his power, always learning new accomplishments or perfecting old ones. I have seldom known a pupil who kept so constantly before his eyes the day when he should meet the enemy in the air or so determined not to be found wanting. By his tragic accident the Flying Corps lose a pilot of a sort we can ill afford, gallant, skilful, and already tried in action, and his numerous friends lose a popular and valued companion."

BENNETTO.—Hubert Victor Bennetto, R.F.C., who was killed in action on August 8th, was the only son of A. E. Bennetto, and husband of "Dot" Bennetto, of Lewisham. He was 27 years of age.

BROOKS.—Sec. Lt. Francis Cyril Brooks, R.F.A., attached R.F.C., who was killed on August 17th, in a flying accident in England, was the elder son of Capt. and Mrs. J. C. Brooks, Sarsdenfield, Canterbury. He was 19 years of age.

CREMETTI.—Sec. Lt. Max Cremetti, D.C.M., R.F.C. (killed on August 14th) was son of Mr. and Mrs. Eugene Cremetti, of Avenue Road, Regent's Park. He was 24 years of age, and had his Army commission in January, 1915; he received his "wings" in September last year.

An inquest was held at Hendon on August 18th. Capt. Maclean, R.F.C., stated that half an hour before the accident, Lt. Perrin flew the machine and reported that the engine was out of order, as it would not give the necessary number of revolutions. The machine was then marked for the attention of the mechanics. Mr. Cremetti, however, said that he did not believe it was out of order, and went up in it. The machine went fairly well at the start, but when about 600 ft. up it dropped about 100 ft. It recovered somewhat, but afterwards it sideslipped, and, falling to the earth, took fire. The pilot was killed immediately, his body being burned almost beyond recognition. The observer, Cpl. Bingham, was badly injured.

Major James Dickson said that if he had been present he would not have objected to Mr. Cremetti going up in the machine, as he was such an experienced pilot. Machines often ran well on the ground but did not go so well in the air. Unfortunately, in this case Mr. Cremetti had been wrong in his judgment.

Medical evidence showed that death was due to shock and fracture of the skull, and a verdict was returned according.

The "Weekly Dispatch" states that Mr. Cremetti was the aviator who, on the occasion of the big aeroplane raid on London on July 7th, twice charged through the raiding squadron and broke up their formation. Following up his success, he chased two of the raiders towards the Channel, and succeeded in bringing one down over the mouth of the Thames. The affair was seen by several of his brother-aviators, and on his return to headquarters he was warmly congratulated by his commanding officer.

THE MISFORTUNES OF WAR.—Another group of R.F.C. officers at Karlsruhe.

Educated at Harrow, Mr. Cremetti entered the Clement-Talbot motor works on leaving school, and remained there until the outbreak of war. When the call for dispatch riders came, he immediately enlisted, and went to France with the original Expeditionary Force. He did very good work during the retreat from Mons and at the Battle of the Marne, where he received the Distinguished Conduct Medal for "conspicuous gallantry and devotion to duty." He was also mentioned in dispatches for distinguished work at Wytschaete, and came home a few weeks later for a commission in the Royal Scots Fusiliers. Wounds received at Wytschaete prevented him being of use to the infantry, and after servng some time he transferred to the Royal Flying Corps.

He had seen considerable service in the air in France before returning to testing work in England.

DENNETT.—Sec. Lt. T. F. P. T. Dennett, Queen's (Royal West Surrey Regt.), attached R.F.C., who died on August 4th of wounds received on the same day, was the only son of Mr. and Mrs. Frank Dennett, of Croydon, and Pett, Hastings, and was aged 22. He was educated at the Whitgift Grammar School, Croydon, and was a medical student at Guy's Hospital. On the outbreak of the war he enlisted as a trooper in the Yeomanry, and went out with the 29th Division to Egypt and the Dardanelles, proceeding to France in March, 1916, where he served until the following August. After training at Cambridge he was gazetted to a commission on December 19th, and was on active service from January to April with his regiment. He was then attached to the R.F.C. after a short training at Brooklands, and met his death while engaged on a reconnaissance as an observer over the enemy lines.

His C.O. writes:—"I cannot tell you how sorry we all are. Your son was extremely popular in the squadron, and was always ready to do his work and take any risks that were necessary. During the time your son was in my squadron I had grown to look upon him as a thoroughly reliable fellow and good officer and a very promising observer."

DOYLE.—While flying near Grays, Essex, on August 17th, Lt. Doyle, R.F.C., came into collision with another aeroplane piloted by Lt. Timmes. Both machines fell from about 250 ft. into the Thames. Mr. Timmes was picked up between the training ship "Cornwall" and the Essex shore, but Mr. Doyle was drowned.

GOODMAN.—Sec. Lt. John E. Goodman, R.F.C., who was killed in aerial action on August 14th, was the eldest son of Mr. and Mrs. Fred Goodman, of Barnes. He was 19 years of age.

HARGREAVES.—Sec. Lt. Cyril Augustus Hargreaves, R.F.C., who died on August 15th from wounds received in action the same day, was the younger son of the late Augustus Hargreaves and Mrs. Hargreaves, of 41, Warham Road, Harringay. He was 20 years of age.

HAY.—Lt. Donald Yalden Hay, Royal West Kent Regt., attd. R.F.C., who was killed whilst flying on August 11th, was the youngest son of John Yalden Hay, of Warley, Bromley, Kent. He was 24 years of age. His promotion to lieutenant was gazetted in June, 1916, and he had his "wings" in February of this year.

JORDAN and HANDLEY.—A biplane from Brooklands aerodrome caught fire in the air and fell in Surrey about noon on August 20th. Lt. H. S. Jordan, R.F.A., attd. R.F.C., who was acting as observer, and the pilot, Sgt. E. Handley, R.F.A., were instantly killed.

They were at a height of about 5,000 ft., in the neighbourhood of Woodham, near Addlestone, when a loud explosion was heard. Flames were seen, and then the aeroplane dived headlong to earth. The engine was embedded nearly two feet in the ground.

Mr. Jordan belonged to Wembley. Sgt. Handley was one of the best pilots that Australia has produced.

It is stated that the mid-air fire, which was attributed to escaping petrol, apparently exhausted itself before the aeroplane struck the ground, for there was no flame amongst the wreckage, portions of which were scattered over the field in which the machine fell.

LARKIN.—A Warwickshire coroner held an inquest on August 20th on the body of 1st Air Mech. Sydney Edward Larkin, of Sydney, Australia, which followed a flying accident near Birmingham.

The pilot, Lt. Belcher, also an Australian, was flying with Larkin, and when about 500 ft. high they encountered a "bump" in a gust of wind. The machine nose-dived and crashed to earth. Mr. Belcher, who is still in hospital, was seriously injured. He has stated that if they had been higher they could have escaped the accident.

A verdict of accidental death was returned.

McCULLOUGH.—Sec. Lt. Alexander F. McCullough, R.F.C., was killed on August 16th by the fall of his machine.

MONTGOMERY.—Lt. Clark C. S. Montgomery, Canadian Infantry and R.F.C., who was killed while flying on August 14th, was the only surviving son of Robert Oliver Montgomery, Vancouver, B.C., formerly of Toronto. He was 22 years of age.

MUNRO.—Sec. Lt. Guy Horace Munro, Royal Fusiliers, attd. R.F.C., who was killed on August 18th whilst flying on home service, was the youngest son of Mr. and Mrs. C. F. Munro, of E. Twickenham. He was 24 years of age.

PHILLIPS.—Sec. Lt. R. Phillips, attd. R.F.C., a Canadian Officer, was killed on August 14th while flying over Lincolnshire, when his aeroplane was seen to fall to the ground, at Welby, near Grantham.

PILLOW.—Sec. Lt. Henry Montgomery Scott Pillow, R.F.C., was killed on Aug. 8th. He was born in March, 1895, and was the second son of Mrs. Pillow, Chief Examiner of the Government colleges for training teachers in cookery and domestic science and vice-chairman of the Public Service Board, and of the late Edward Pillow, for many years Education Secretary to the Norfolk County Council. He was educated at Norwich Grammar School, and was a student at Guy's Hospital. Within a month of the outbreak of war he joined the Public Schools Brigade, and shortly afterwards went on active service abroad as a private in the Royal Fusiliers. After seven months of service in the trenches he was sent home to train for a commission, and in due course he was gazetted to the Middlesex Regt., and later transferred to the R.F.C. After gaining the full qualifications, he went to the front on July 28th, and met his death within 10 days. His elder brother, now the only surviving child of Mrs. Pillow, is also an officer, and is serving abroad.

REINCKE.—Capt. L. F. Reincke (Leo), The Duke of Wellington's Regt., attd. R.F.C., who was killed in action on August 17th, was the son of Mr. and Mrs. L. Reincke, 5, Champion Park, Denmark Hill, S.E.5. He was 29 years of age.

ROWLANDS.—Lt. Rowlands, R.F.C., aged 22, made a flight over Lincolnshire on August 15th, and in landing his machine came into collision with a house. Mr. Rowlands, who came from the Liverpool district, was killed outright, his head being crushed by falling brickwork.

SOLLY.—Capt. Arthur Norbury Solly, R.F.C. (killed in action on August 11th), was twenty-three years of age, and the elder son of Mr. and Mrs. Ernest Solly, of Harrogate. He transferred from the New Armies to the R.F.C., and had his "wings" in March, 1916.

SWORDER.—Lt. Hubert Pelham Sworder, The Queen's (Royal West Surrey Regt.), attd. R.F.C., whose death was announced last week, was educated at Haileybury, where he was captain of the gymnastic six, and Sandhurst. He was a keen follower of hounds, and hunted with the Puckeridge Foxhounds and the Eastern Counties Otter Hounds.

He was made temporary captain some months ago, owing to his being brigade signalling officer, but relinquished this rank on joining the R.F.C. in August, 1916. He was only nineteen when killed.

VALENTINE.—Major James Valentine, D.S.O., R.F.C., whose death was recorded last week, was the only child of the late James Valentine, managing director of the Northern Assurance Company, Moorgate Street, and his mother was, before her marriage, Miss Fanny Roe, a member of an old Norwich family.

[Owing to a lamentable error on the part of the printers a paragraph in the appreciation of the deceased officer, written by one of his oldest friends, was made to appear devoid of sense. The paragraph should have been:—

"Later I stayed with him in Cheshire. Surely there never was on earth a greater incongruity than the association of Jimmy Valentine with his vivid driving and the old Georgian mansion sleeping nobly in a wooded park where his Fates had led him for a temporary residence! Here, too, his gaiety overcame the disapproval not unnaturally brought into being by the vehemence of his passage over the country roads."]

ENGAGEMENTS.

BARRY—JONES.—An engagement is announced between Lt. James Vincent Barry, R.F.C., second son of the late James Hewitt Barry, of Calcutta and London, and the late Mrs. Barry, of Hillbrow, Horsham, and Löis Vèra, only daughter of the late Harold Jones, M.I.C.E., and Mrs. Harold Jones, of 8a, Longridge Road, Earl's Court.

DICKINSION—WAUCHOPE.—The marriage arranged between Capt. C. J. Dickinson, R.F.C., and Janet Caroline Sutherland Wauchope will take place quietly in London on the 23rd inst.

GETHIN—STAPLEDON.—An engagement is announced between Major P. E. L. Gethin, R.F.C., youngest son of Sir Richard Gethin, Bart., and Lady Gethin, of The Grove, Hythe, Southampton, and Norah, elder daughter of Mr. and Mrs. I. N. Stapledon, of Knapp, East Anstey, Devon.

HAYNES—WALKER.—The engagement is announced of Capt. C. C. Haynes, Devonshire Regt. and R.F.C., eldest son of

Col. C. E. Haynes, C.B., R.E., and Mrs. Haynes, Kerries, South Brent, South Devon, and Sheelah, youngest daughter of the late Lt.-Col. G. Lemon Walker, I.M.S., and of Mrs. Walker, St. Heliers, Jersey, C.I.

IRONS—SMITH.—A marriage has been arranged, and will take place in November (leave permitting), between the Hon. Winifred Smith, daughter of Lord and Lady Colwyn, of Colwyn Bay, and Capt. T. R. Irons, R.F.C., son of Mr. and Mrs. T. Irons, of Sydney, Australia.

MARRIAGES.

EASTLEY—WINTLE.—On July 6th, 1917, at the Cathedral, Bombay, Charles Mortimer Eastley, R.F.A. and R.F.C., eldest son of Mr. and Mrs. Charles H. Eastley, of Paignton, S. Devon, was married to Esme Beryl Chester, elder daughter of the late Lt.-Col. E. de V. Wintle (12th Cavalry, F.A.) and Mrs. Wintle, of Gulmarg, Kashmir.

GOULD—MOCKRIDGE.—On Aug. 11th, at the Parish Church, Pyrford, Surrey, Capt. Robert Gordon Gould, M.C., R.F.C., eldest son of Mr. Robert Gould and Mrs. Gould, Pinecroft, Pyrford, was married to Margaret, second daughter of Mr. Whitney Mockridge and Mrs. Mockridge, of Pine Lodge, West Byfleet, Surrey, by the Rev. Cuthbert Hamilton.

RANDALL—CAREW-ROBINSON.—On August 18th, at St. Peter's, Eaton Square, Gerald Frayne Randall, R.F.C., only son of the Rev. H. L. Randall, Rector of Cockling, Sussex, and Mrs. Randall, was married to Barbara, only daughter of Mr. and Mrs. C. Carew-Robinson, of 27, Ashley Gardens, S.W., and Bepton, Midhurst, by the Rev. Stuart Clark, Vicar of Tonbridge, assisted by the Rev. Basil Phillips, Vicar of Farnborough.

BIRTHS.

CALEY.—On August 17th, at Doone Cottage, Addlestone, Surrey, the wife of Sec. Lt. Arthur Henry Caley, R.F.C.—a son.

CURTIS.—On August 15th, 1917, at The Grove, Stutton, Ipswich, the wife of Lt. J. S. Curtis, R.F.C., of a son, still-born.

MACLEAN.—On August 18th, at Littlecott, Enford, Wilts, the wife of Lt.-Col. A. C. H. MacLean, The Royal Scots and R.F.C., a son.

ROMANES.—On the 18th inst., at Broompark, Helensburgh, the wife of Capt. J. Romanes, R.F.C., a son.

STUART BLACK.—On August 12th, at "Llangors," Wolsey Road, East Molesey, Surrey, the wife of Sec. Lt. J. Stuart Black, R.F.C., late of the Middlesex Regt., of a daughter.

FRANCE.

OFFICIAL COMMUNIQUÉS.

AUGUST 16th.—Our aviators copiously bombarded last night and this morning the enemy bivouacs and cantonments to the north and east of Houthulst Forest (south-east of Dixmude), as well as Lichtervelde railway station (12 miles east of Dixmude).

In the course of our attack in the Ailles-Hurtebise (Aisne) sector our aeroplanes, undeterred by the bad weather from flying very low, accompanied the advance of our infantry and at a low altitude attacked with machine-guns the enemy's shelters and reserves.

ARMY OF THE ORIENT.—Twenty-three French and five Italian aeroplanes have bombed the enemy camps in the region of Pogradec (south of Lake Ochrida), while British aviators bombed the depots in the region of Seres (Struma front).

AUGUST 17th.—Our aeroplanes have taken an active part in the operations on the Belgian front. They engaged in numerous combats with enemy aeroplanes, two of which were brought down and two compelled to alight in their lines.

Furthermore, while flying at a very low altitude, they attacked successfully with bomb and machine-gun enemy troops, railway trains, and aviation grounds.

Two German aeroplanes have been brought down by the fire of our special guns.

AUGUST 18th.—German aeroplanes bombarded the region north of Nancy. There were no victims.

During the day of August 17th and the night of August 17th-18th our bombarding aeroplanes carried out many flights over the enemy's lines. One hundred and eleven of our machines took part in various flights, in the course of which 13,000 kilograms of projectiles were dropped on the enemy's establishments. Two of our machines have not returned.

The aviation grounds of Colmar, Frescati, and Habsheim (just east of Mulhouse), the aviation camp in the region of Chambley (14 miles south-west of Metz), the railway stations of Freiburg, in Breisgau, Longuyon (10 miles south-west of Longwy), Montmédy (19 miles west of Longwy), Pierrepont (seven miles south of Longwy), St. Juvin, Grand Pré, Challerange (all three south-west of Dun-sur-Meuse), and Dun-sur-Meuse, etc.; and the bivouacs of the Spincourt Forest (about 17 miles north-east of Verdun) were copiously showered with projectiles. Many explosions on the objectives were observed, and several fires broke out.

During the night of August 16th-17th the railway station of Cortemarck (10 miles east of Dixmude) was also visited by our aircraft. A violent fire broke out in the railway station buildings.

During the day yesterday 7 German aeroplanes and a captive balloon were brought down by our pilots, and 8 other enemy machines fell in their lines gravely damaged.

ARMY OF THE ORIENT.—The British air forces bombarded enemy installations in the region of Demirhissar. The French air force bombarded those in the Resna region.

AUGUST 19th.—Our chasing aeroplanes were particularly active yesterday (the 18th). Eleven German machines fell in flames or were completely destroyed as the result of air engagements with our pilots. In addition 6 enemy machines were forced to land in their own lines seriously damaged.

During the night of the 17th-18th and in the daytime yesterday (the 18th) our aeroplanes bombarded the railway stations of Cortemarck, Thourout, Lichtervelde, Ostend, and Cambrai, the hutments in the Forest of Houthulst, the railway stations of Dun-sur-Meuse and the munition dumps at Bantheville (south-west of Dun). Fire broke out in the Cambrai station and in the establishment.

AUGUST 20th.—Our aviators played a brilliant part in the battle, firing with machine-guns on enemy gatherings from low altitudes and thus contributing to the repulse of the counter-attacks.

Our pilots brought down 11 German machines in front of the Army, and two other German aeroplanes were brought down by our special guns.

* * *

A report from Paris, dated August 17th, states that a Decree has been issued charging the Under Secretary of State for Military Aeronautics with the chief control of the Naval Air Services and with the establishment of a complete liaison with the air services of the Allies.

* * *

A report from Paris, dated August 14th, states that Capt. Guynemer has been appointed an Officer of the Legion of Honour in recognition of his services as a pilot. One of his most brilliant exploits was on May 25th, when, in one minute, he accounted for two enemy aeroplanes, and in the same flight had two more victories. Altogether he had brought down 45 machines.

GERMANY.

OFFICIAL COMMUNIQUÉS.

AUGUST 14th.—In numerous aerial battles nine enemy aeroplanes and two captive balloons were shot down. On August 12th Ober-Lt. Dostler brought down his 23rd and 24th opponents.

Yesterday (August 12th) evening at 8 o'clock a hostile aeroplane dropped five bombs on Frankfurt-on-Main. Two men, one woman, and one child were killed, and 12 other persons were wounded. No damage of a military character was done. While returning the raider was brought down near Saargemünd (about 90 miles south-west of Frankfurt) by two of our aeroplanes, and the French occupants were made prisoners.

AUGUST 15th.—By their acuteness and ability the battle echelons of our aviators have developed themselves into a valuable arm of attack against trench and battery objectives.

In aerial battles, which were specially numerous in Flanders, and as a result of anti-aircraft fire, 20 enemy aviators and captive balloons were shot down yesterday.

AUGUST 17th.—Sixteen enemy aeroplanes were shot down. Baron von Richthofen has thereby gained his 58th and Ober-Lt. Dostler his 25th aerial victory.

AUGUST 18th.—By means of our aviators and anti-aircraft fire 26 enemy aeroplanes were brought down and also 4 captive balloons, the latter in flames. Senior Lt. Dostler gained his 26th, Actg. Officer (vice-sgt.-maj.) Müller his 22nd, and Lt. Gontermann, by the shooting down of two of the captive balloons, his 29th and 30th aerial victory.

AUGUST 19th.—Yesterday 19 aeroplanes and one captive balloon was shot down in aerial encounters. Chasing Squadron No. 11, for a long time conducted by Capt. von Richthofen, yesterday, after seven months of activity, brought down its 200th adversary. One hundred and twenty-one machines and 196 machine-guns have been captured by this echelon.

AUGUST 20th.—An enemy squadron of seven aeroplanes appeared over Freiburg on Friday afternoon between 12.30 and 1 o'clock and dropped several bombs. Four persons were injured and three buildings damaged, but no military damage was done. German battle aeroplanes shot down an enemy machine, which crashed to the ground.

WESTERN FRONT.—Sixteen enemy aeroplanes and four captive balloons were brought down yesterday. Lieut. Gontermann shot down three captive balloons and one aeroplane, thereby increasing his aerial victories to 34. Acting Officer Vice-Sergeant Müller was victorious for the 23rd and 24th time in aerial engagements.

* * *

A telegram from Frankfort states that at a special meeting of the municipality on August 13th, the burgomaster strongly de-

nounced the recent raids by French aviators, and declared that Frankfort was an undefended city.

A resolution urging the military authorities to make prompt reprisals was passed.

[How very English.—Ed.]

ITALY.

Official Communiqués.

August 14th.—In a combined action numerous batteries and a large flight bombarded on the afternoon of the 13th inst. the enemy's military works at Modrea and Modrejce (south of Tolmino) (Isonzo), damaging them severely and partly setting them on fire.

August 15th.—Yesterday morning one of our large bombardment flights, strongly escorted, reached the important railway centre at Assling, in the Sava Valley (south-east of Villach), with the object of damaging it and interrupting the intense traffic of the enemy there.

A second flight, not less powerful than the first, repeated the operation in the afternoon, having as its objective the steel works situated in the same locality.

The results which it was possible to observe proved very satisfactory.

Six and a half tons of explosive bombs of medium and large size, and also incendiary bombs, were dropped, and direct hits were obtained on some works, while other buildings, including the railway station, were set on fire.

All our aeroplanes, after having carried out this most daring operation (which was the more difficult on account of the distance to the centre bombarded) returned to their bases safely, passing through the screen of the enemy's fire, and repulsing in brisk air duels the numerous enemy machines risen to oppose them.

August 17th.—Yesterday afternoon one of our flights effectively bombed enemy encampments and military assembly centres east of Comen (15 miles east of Monfalcone). All our aeroplanes returned safely to their bases.

August 18th.—Flights of aeroplanes and airships are bombarding troops massed behind the enemy lines.

[This refers to the Italian offensive in the Tolmino district.]

August 19th.—In the morning one of our bombardment flights renewed the raid on the Comen (12 miles east of Monfalcone) military works with very effective results. All the aeroplanes returned safely to their bases.

August 20th.—The battle is proceeding on the Julian Alps front.

Altogether 208 aeroplanes indefatigably participated in the battle, attacking repeatedly with bombs and machine-guns the troops assembled to the rear of the enemy positions.

* * *

A message from Rome states that in mid-Adriatic on August 18th an Italian seaplane sank an enemy submarine by bombs, securing direct hits.

* * *

The following message from Rome, dated August 17th, is from the "Morning Post":—

During an Austrian aeroplane raid on Venice early on Tuesday morning Italian art suffered another disastrous loss. The enemy's bombs destroyed a portion of the wonderful ceiling of the civil hospital of SS. John and Paul, which was originally the Grand School of St. Mark. This ceiling was considered one of the largest, richest, and most ornate in Italy. It was originally made in the year 400 A.D., and was reconstructed in mediæval years after a fire which destroyed the school. Fortunately, sufficient of the ceiling is left intact to allow reconstruction on the original design and scale.

RUSSIA.

Official Communiqués.

August 14th.—German aeroplanes dropped bombs on the railway stations at Molodetchno and Siniavka.

August 16th.—During the night of August 14th our aviators made a flight over the Courland coast. The bombs they dropped caused conflagrations.

BELGIUM.

Official Communiqué.

August 14th.—In spite of the unfavourable weather yesterday, our artillery, energetically directed by our aviators, carried out successful destructive fire against the enemy artillery, which replied by shelling certain parts of our trenches and lines of communication in the Ramscappelle region with gas shells.

In spite of the barrages put up by enemy squadrons, our aviators went up on photographic distance flights behind the German positions.

August 17th.—Our aviators have been very active, having carried out 75 flights. One of our aviators yesterday brought down an enemy machine above the forest of Houthulst.

HOLLAND.

A report from Amsterdam states that the Germans committed a violation of Dutch neutrality on August 18th. German aeroplanes came down at Blyham and Beerta, small towns in Groningen Province, near the German frontier. That which descended at Blyham was on fire, and later its crew of three men were discovered uninjured. The aeroplane which came down at Beerta is said to have been hit by a bullet fired by a Dutch sergeant, which broke off part of the air-screw. These aeroplanes came from Ghent, and when above The Dollart (in the Ems estuary) they thought they had reached Germany. The number of the aeroplane which came down at Beerta was S.S.W. 1,055; it was also marked K.K.

* * *

A message from Zierikzee, says that a squadron of aeroplanes passed over the coast of the island at 11.30 a.m. on August 18th and threw three bombs, one of which fell on Moermond Castle, near Renesse, and another near Noordwelle, in an open field. Aerial torpedoes were also found in the district. No one was injured, but much damage was done. The aircraft went in the direction of Brouwershaven, on the north side of Schouwen.

* * *

A Goedereede (Goeree Island) telegram reports that at the same hour two aeroplanes of unknown nationality appeared above Stellendam, coming from the south-east and disappearing to the north-east. Six bombs were thrown just outside Goedereede.

U.S.A.

From the New York correspondent of the "Daily Chronicle," dated August 18th:—American Government experts, privately at work for months past, have devised an aeroplane engine which is more powerful than any at present in use.

While its peculiarities are necessarily a rigid secret at present, it is known that the engine has only been perfected after exhaustive experiment with every known type.

Parts can be standardised with ease, so that the manufacture of the machines may be carried out on an unprecedented scale.

[One sincerely hopes that the construction of this wonderful engine is as rigid as its secrecy, and that its weight is less notable than its power. The exhaustive nature of the experiments seem to suggest a curious hybrid if details have been borrowed from engines of every known type.—Ed.]

THE CURTISS CORRUPTION CHARGES.

Sir John Dickinson, at Bow Street, on August 17th, resumed the hearing of the case in which William Augustus Casson, aged 64, barrister and retired Civil Servant, of Bedford Road, Chiswick, and Wing Comdr. John Cyril Porte, R.N.A.S., are charged with having conspired together and with Lyman J. Seeley and other persons to contravene the provisions of the Prevention of Corruption Act, 1906. Comdr. Porte was again absent through illness, but was represented by Mr. R. D. Muir.

Mr. Arthur William Smallwood, Assistant Director of Contracts at the Admiralty, stated that prior to the war the Admiralty had no contracts with the Curtiss Company. The first contract, just after the commencement of the war, was for the purchase of the "America" and her sister flying boat. This was followed by various other contracts for aeroplanes, motors, spares, etc., respecting which contracts the witness proceeded to give the dates and other details.

Large remittances were made to America by the Admiralty in payment, the total of these amounting by December, 1915, to several millions of dollars. He could not say positively how these remittances were made—whether through the firm of Morgan or otherwise; the Accountant-General would be able to give particulars on that point. Remittances were made not only against goods actually delivered, but also in advance in respect of goods to be delivered thereafter.

In 1916 the whole position between the Admiralty and the Curtiss Company was embodied in a new contract, dated September 21st. At the same time the position of the London agency of the Curtiss Company was considered and dealt with. Witness had never seen Mr. Seeley, the London agent, personally on these matters, though some of the contracts had been negotiated through him, nor had he ever had any communications or interviews with Casson. It was only after Lt. Neilson's return from America in the autumn of 1916 that witness first heard any suggestions about commissions having been paid by the Curtiss Company to be afterwards divided between Mr. Casson and Comdr. Porte.

Mr. Muir: You have spoken of advances being made to the Curtiss Company before goods were delivered. Similar advances were being made, were they not, to other manufacturers in different parts of the world? Witness: Yes.

Mr. Muir: That was to enable them to increase their plant and accelerate the rate of production? Witness: Yes, and generally to enable them to fulfil their contracts.

The Attorney-General said he now proposed to put in as evidence the statements made by the defendants before the committee appointed by the then First Lord of the Admiralty and presided over by Mr. Butcher, K.C. This would be a convenient time for the Court to hear and decide on the objections which he understood counsel for the defence desired to make to the admission of those statements as evidence. The Attorney-General proceeded to state the grounds on which he maintained they ought to be admitted, and reviewed at length the legal decisions bearing on the point.

Mr. Muir submitted that the statement made to the Committee by Comdr. Porte ought not to be admitted in evidence against him, as it had not been proved that it was in any sense a voluntary statement, and in the absence of such proof it was not, according to certain precedents which he quoted, admissible. Even if it was held not to be strictly inadmissible in law, he contended that the magistrate in the exercise of his discretion ought to exclude it. So far from Comdr. Porte's statement to the Committee having been a voluntary one, he was practically under compulsion as a naval officer to attend the inquiry and answer questions, and, in fact, he had been examined as if he were a hostile witness and a person to whom suspicion attached.

Mr. Patrick Hastings followed on the same side, and pointed out that practically the only evidence against the two defendants was based on the answers extracted from them at the Committee of Inquiry in confidence and without any warning of their answers being subsequently used against themselves. Evidence obtained in such a way ought not to be admitted in support of criminal proceedings.

Sir A. Bodkin having replied for the Crown, Sir John Dickinson said he was clearly of opinion that the statements made by the defendant before the committee could be used in evidence, and therefore he must admit them.

Sir A. Bodkin: They are already before the Court in the form of exhibits, and there is no need to occupy time in reading them publicly.

Mr. E. T. Stainforth, a member of the Stock Exchange and partner in a firm carrying on business at Copthall Court, said that in 1915-16-17 his firm acted for Mr. Casson. Witness bought a number of securities for him, and by his instructions those securities were in many instances bought in the name of J. C. Porte. Witness also spoke as to a number of securities being transferred back from Comdr. Porte to Mr. Casson. The latter did not give him any explanation of the reason for such transfer.

Mr. E. More, manager of a stockbroking firm in Tokenhouse Yard, gave evidence as to buying for Mr. Casson, who was a client of the firm, 600 shares costing £2,385 15s. Of these, 300 were bought in Mr. Casson's own name and 300 in the name of J. C. Porte. There were subsequently other transactions of which witness produced a detailed account.

The hearing was again resumed at Bow Street Police Court on August 18th.

Sir Francis J. S. Hopwood said that in August, 1916, being then Additional Civil Lord of the Admiralty, he heard certain statements from Lieut. Neilson, R.N.V.R., in connection with the Curtiss Company. He then heard for the first time of Mr. Lyman J. Seeley. Shortly afterwards Mr. Seeley called on him, and in the course of conversation referred to his commissions from the Curtiss Company. Mr. Seeley said that originally there had been an arrangement between him and Mr. Curtiss, who had befriended him, under which he received a small salary, plus a commission of 1 per cent., but when, in consequence of the war, increased business seemed to be imminent, he had made certain fresh arrangements with Mr. Curtiss, under which his commission was increased by 15 per cent., making it 16 per cent. in all.

Witness understood from Mr. Seeley that that commission, putting it generally, was payable on all sales of the company's products in Great Britain, and witness thought in Europe also, with the exception of Russia. According to Mr. Seeley's account his position was that of sales agent, and the commission was payable to him as such. Mr. Seeley told him he had been in touch with the Air Department of the Admiralty from shortly after the outbreak of war.

Witness put it to Mr. Seeley that under the arrangement he had described he must have received a very considerable sum of money—that it must have run into six figures—and to that Mr. Seeley assented, but he said he had by no means drawn all the money, and was leaving much of it deposited in the United States. Witness thought that the Farmers' Trust and Loan Co. was mentioned as the agency through which amounts were remitted to Mr. Seeley from America.

Witness asked him if he had parted with any portion of his commission to other people, particularly to servants of the Crown, and he replied, "Most certainly not." Towards the end of the interview Seeley mentioned the name of Mr. Casson, who, he said, had had business relations with Mr. Curtiss and the Curtiss Company, and had made a claim on the latter for commission under some sales agreement. Mr. Seeley added that he had found it desirable, in his own interest, to enter into an agreement with Mr. Casson for the division of the 15 per cent. between them in equal shares—7½ per cent. to each. Nothing was said about what Mr. Casson had done to earn his share of the commission.

On October 30th, Mr. Casson called upon witness at the Admiralty in company with Mr. Seeley. In the course of the conversation on that occasion, Mr. Casson spoke of work he had done in connection with air enterprises, mentioning, he believed, the Blériot Company, and afterwards referred to the division of the 15 per cent. commission, and explained that he received his share of 7½ per cent. by virtue of the agreement existing between the Curtiss Company and Mr. Seeley. Witness suggested to Mr. Casson that the total commission must have amounted to over £100,000, and asked him if he had parted with any of his share of the money to any servant of the Crown, particularly Commander Porte, and he replied in the negative, saying most distinctly that no one but himself had any rights in the 7½ per cent. Mr. Casson mentioned that he knew Commander Porte and his affairs intimately, and was his family trustee.

Mr. Seeley was present throughout the interview, and did not dissent from anything Mr. Casson said, nor, on the other hand, did Mr. Casson dissent from anything Mr. Seeley said. Mr. Seeley tried to make a point of the commission being only 15 per cent., whereas in the trade the usual commission under sales agreements was 25 per cent. Mr. Seeley also said that Captain Elder, who represented the Admiralty in America, knew that the commissions were being paid.

In connection with the fact that when the Admiralty settled their new contract with the Curtiss Company a clause was inserted prohibiting the payment of any commissions, both Mr. Casson and Mr. Seeley appealed to witness to waive that prohibitive clause, and he was obliged to decline absolutely to do so.

Replying to Mr. Patrick Hastings, Sir Francis Hopwood said that Mr. Seeley with great candour offered to submit to the Admiralty any documents they might wish to see, and even to produce his bank pass-book. Mr. Casson was equally frank in offering to show any documents he possessed, except that he did not mention his pass-book.

Mr. Muir intimated that Comdr. Porte was so far improved in health that he hoped to be able to be present next week, as he was most anxious to be, to hear read over the evidence which had been given in his absence.

Sir A. Bodkin suggested that that course would be unnecessary, and that it might be obviated by Comdr. Porte being supplied with a copy of the depositions.

Sir John Dickinson agreed, and Mr. Muir accepted the proposal on the distinct understanding that his client should not be in any way prejudiced by being prevented from attending the court, which he was most anxious to do.

Several witnesses were briefly examined as to the banking accounts of Mr. Seeley, Mr. Casson, and Comdr. Porte at various banks, and Sir A. Bodkin said that closed the case for the prosecution.

Sir John Dickinson said Casson would be committed to take his trial at the Central Criminal Court, the same bail as before being accepted for his appearance. Mr. Hastings said he would reserve his defence.

A legal discussion ensued as to the course to be adopted in regard to Comdr. Porte, owing to his absence, Mr. Muir contending that he must either be committed for trial or have the summons against him dismissed, but eventually it was decided that the summons against him should stand adjourned, *sine die*.

MUNITIONS OR THE ARMY.

(From the "Morning Post," August 21st.)

At the London Munitions Tribunal on August 20th a tool machine foreman of a firm supplying gauges to the Ministry of Munitions unsuccessfully applied for a certificate of release, as he wished to accept a commission in the Royal Flying Corps as equipment officer to take charge of a workshop. He claimed that his skill and qualifications would make him of more service to the State in his new capacity, as the work would be more important.

The manager of the firm produced a communication from the Ministry of Munitions stating that in his present employment the man was doing as important work as it was possible for him to do, and that they had the utmost difficulty in obtaining skilled labour for their requirements. The manager also suggested that the Army had been guilty of an offence against the Defence of the Realm Regulations, as the man had been approached and tempted with the offer of a commission.

Applicant: I was not approached; it was purely voluntary. An officer asked me if I could recommend a man for a certain position, and after thinking the matter over I said that I would accept it.

The Chairman (Mr. Sherwood): If the Army has broken the Defence of the Realm Regulations, they can no doubt be dealt with. (Laughter.)

THE R.F.C. HOSPITAL FUND.

From the "Johannesburg Star" of July 12th:—

The hon. treasurer of the Johannesburg Ladies' Committee of the Royal Flying Corps' Hospital Fund (Mr. M. Honnet, P.O. Box 149, Johannesburg) acknowledges with thanks the receipt of the following sums:—Per Miss Buckland, proceeds of concert given by girls of Johannesburg High School, £10; Mrs. F. Mascall, £5; per Mr. Spicer, raffle of aeroplane, £7 11s.; per Mrs. McCubbin, £1 10s.; per Mrs. McCubbin, collected from tramwaymen, £1 17s. 6d.; American auction of needlework at Carlton Hotel on July 4th, £157 18s. 3d.; Mrs. R. Goldman, £5; Mrs. J. B. Mackinlay, Doreen, Stanley and Louis Norton, £1 10s.; S. Sondheim, £10; C. L. R., 10s.; Martha Washington Club, £25—£255 16s. 9d. Per Mayoress of Kroonstad (local collection), £13 3s. 6d.; per Mayoress of Bethlehem (street collection), £19 9s.; per Mayoress of Vereeniging (street collection), £40 17s. 1d.; per Mayoress of Port Elizabeth (street collection), £97 3s. 2d.; per Mr. James B. Cox Eshowe and District War Relief Committee, £10—£406 9s. 6d.; Johannesburg (street collection*), £768 3s. 6d. Total to date, £1,174 13s.

* Note.—Of the amount collected in Johannesburg £6 19s. 2d. was collected on the Robinson Mine by Mrs. Bryant, and £6 17s. on the Crown Mines by Miss MacIntosh.

[Congratulations to South Africa.—Ed.]

AIRCRAFT IN THE HOUSE.

On August 14th **Mr. Pemberton-Billing** (Hertford, Ind.) asked the Leader of the House whether the Government had any power to insist on a system of warning against air raids being introduced in any given town in England, or whether the matter was left entirely to the local authorities; whether the casualties at Southend could have been avoided had warning been given; whether the authorities had half an hour in which to give warning and no warning was given; and whether the Government would insist under the Defence of the Realm Act that in certain towns a system of warning should be introduced.

The Chancellor of the Exchequer: I really cannot say what the powers are, but I shall discuss the matter with the Home Secretary.

* * *

On August 17th **Sir G. Cave** (Kingston, U.), answering **Mr. Pemberton-Billing,** said:—The issue of any public warning outside the Metropolitan Police District must generally be left to the local authorities, who know the local circumstances and the

wishes of the inhabitants; but the Home Office will be glad on application to give any advice or assistance which may be desired.

Replying to another question, he said:—The warnings by sound signal are intended for air raids by day only, i.e., between half an hour before sunrise and half an hour after sunset. Should an air raid occur during the hours of darkness, between half an hour after sunset and midnight, when there is less real danger than by day but much greater risk of a false alarm, the sound signals will not be fired, as they would unnecessarily disturb persons already under cover, but the police will circulate through the streets carrying the "Take Cover" placards, so that pedestrians may seek cover.

AN ENLIGHTENING GLIMPSE.

Mr. C. E. W. Bean, writing from British Headquarters on August 6th, of the Australian Artillery in the Ypres battle, says:—

Limbers had just been moved off and the guns got into position when, whirr! overhead a German aeroplane, flying under low clouds, wheeled over them. They could see the pilot in his seat and the bombs as he dropped them one after another over the batteries. But his journey was too hurried for aiming. Every bomb fell wide. He then turned to his machine-gun. Six times during the day German machines, amongst the whirling collection which circled low overhead, fired on these gun crews with machine-guns. The Australians rigged up a Lewis gun which they found in a crater and a Vickers gun left in a trench. These (with batmen, signallers, and spare men using rifles) were turned on to attack the planes whilst the battery continued its work.

Through all this, and under heavier shell-fire as the day went on, the Australian batteries carried out every order which reached them through a long day, exactly as if on a practice ground. "I had rather have lived those first six hours," said one to me, "than any other day of my life."

[From which one judges that the German aeroplanes were not confined by fear to their own side of the lines, as our officially doped Press would have us believe.—Ed.]

WHITEHEAD AIRCRAFT SPORTS.

The athletic sports meeting of the Whitehead Aircraft Co., Ltd., duly took place on Saturday last at the company's grounds at Feltham, and proved a great success, several thousand spectators being present, amongst whom were some three thousand of the company's employees. All events were, of course, confined to them, but, as athletic performances, their quality was well above the average, A. Northover, the winner of the 100 yards championship, showing himself to be an exceptional sprinter, with much staying power as well, for he also won the 440 yards handicap in the easiest fashion by some 50 yards.

The Ladies' Race (60 yards) was won by Miss A. Drew; the Richmond team beat Hanworth in the departmental tug-of-war; Sopwith's beat Whitehead's in another tug-of-war; and Captain Prior obliged with a clever and much admired exhibition of trick flying.

PUBLICITY.

Mr. A. J. M. Gray, who is well known as one of the most brilliant writers in the motoring press, and who has had vast experience of advertising in all its branches, has recently entered into partnership with Mr. E. H. Morris, and has started a publicity agency known as "The Gray Company," at 5, King's Street, W.C.2. The firm has an excellent connection among motor manufacturers, for many of whom the partners have done advertising service and consulting work in the past. The firm propose to undertake the buying of space and advertisements for manufacturers, and those with any knowledge of the partners will be prepared to vouch for the high quality of the work which they will do.

TRADE CARDS.

TRADE CARDS.

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FINANCE.

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British School of Aeronautics. — Aircraft Engineering Course; Aero Design; Aero Construction; Aero Draughtsmanship; Mechanical Engineering. — Pennington's, 254, Oxford Road, Manchester.

PUBLICATIONS.

"MONO" INSTRUCTION BOOK No. 1 issued by the Gnôme and Le Rhône Engine Co. New Edition. The Wm. Dawson Publishing Co., Ltd., 2, Breams Buildings, E.C. Price 4s. 6d. net. Post free, 5s.

Small Factory Output and How to Speed It. By G. H. Mansfield. Price 1s. 3d. net. Post free, 1s. 6d. The William Dawson Publishing Co., Ltd., 2, Breams Buildings, E.C.

Aeroplane Design—by F. S. Barnwell (Capt., R.F.C.), with an appendix on Inherent Stability by W. H. Sayers (Lieut., R.N.V.R.), Post Free, 2s. 9d.—The William Dawson Publishing Co., Ltd., 2, Breams Buildings, E.C.

"Air Navigation for Flight Officers," by Lt.-Comdr. A. E. Dixie, R.N. 10s. 6d. net, post free, 11s. The Wm. Dawson Publishing Co., 2, Breams Buildings, E.C.

(*Continued on page 560.*)

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PATENTS.

PAGE & ROWLINGSON, Chartered Patent Agents (Consulting Engineer, Mr. S. E. Page, A.M.Inst.C.E.), 27, Chancery Lane, London, W.C. Tel. 332 Central.

Henry Skerrett, Chartered Patent Agent, 24, Temple Row, Birmingham.—Patents, trade marks, and designs.

SITUATIONS VACANT.

Sheet Metal Workers for aeroplane work. Men on Government work or residing over 10 miles away need not apply. Good wages. Apply personally at 10 o'clock any day to the Aircraft Construction Co., Harley Aeroplane Works, Beckton Road, E. 'Phone: East 1300.

Splicer required for steel cables (aeroplane erection). First-class workman essential. No one already engaged on Government work or resident more than 10 miles away will be engaged.—Apply personally or by letter to Works Manager, Handley Page, Ltd., Kingsbury Works, Edgware Road, Hendon, N.W.

Wanted Experienced Mechanical Draughtsman, capable of taking out quantities of materials. Knowledge of aeroplane and seaplane construction an advantage, but engine design not essential. No person already on Government work will be engaged.—Apply your nearest Employment Exchange, quoting No. A.3553.

Propeller Shapers required at once. Men on Government work or residing more than 10 miles away need not apply. Good wages.—Apply, The Pegasus Aircraft Co., Ltd., Totterham Street, Tooting, S.W.17.

Experienced Foreman or Manager required for Aircraft Metal Work; must be expert on machine tools. Anyone already engaged on Government work or residing more than 10 miles away need not apply.—Caffyn's, Ltd., Eastbourne.

Wanted, Foreman Assembler, capable of taking charge of small progressive woodwork shop. No one on Government work need apply.—Applications must be made through nearest Employment Exchange, mentioning this paper and Box No. 2044.

Aeroplane Wing-making and doping; experienced workers wanted. Those on Government work or living more than 10 miles distant need not apply. Call 10 to 12, and 2.30 to 4.—Sage and Co., Ltd., 58, Gray's Inn Road, W.C.1.

Practical Manager wanted for Propeller and spares department; unique opportunity for competent man. State salary, references and previous experience. No one on Government work need apply.—Applications must be made through nearest Employment Exchange, mentioning this paper and Box No. 2042.

SITUATIONS WANTED.

Position in control of works: building, repairing, and factory maintenance and yard staff. Expert and methodical organiser.—Box No. 2027, The Aeroplane, 166, Piccadilly, W.1.

As Manager or Shop Foreman in aeroplane and woodworking department. Thoroughly experienced in its essentials, including woodworking machinery, timber selection, conversion. Good organiser: early riser: highest references.—Box No. 2018, The Aeroplane, 166, Piccadilly, W.1.

As Foreman Erector in Aircraft Works. Three years' practical experience on various types of machines, and fifteen years' practical experience as an engineering patternmaker. Age 32 years.—Box No. 2045, The Aeroplane, 166, Piccadilly, W.1.

Young Man, smart, finally rejected, wants position in aircraft works.—Apply Box No. 2046, The Aeroplane, 166, Piccadilly, W.1.

Foreman or Responsible Position. Indentured Coppersmith Sheet Metal Worker. 3 years' aircraft experience of tanks, bends, assembling, stampings, panels and cowlings. Wide knowledge of duralium work and drawings. 26G aluminium welder, with theoretical knowledge. Conversant all types.—"B," 4, Dalmeny Road, Tufnell Park, London, N.7.

Qualified Aeroplane Draughtsman and Designer, disengaged, desires position, London, or near London, preferred.—Box No. 2047, The Aeroplane, 166, Piccadilly, W.1.

Aero Engine Manufacturer (Works or General Manager) is open to consider offer from progressive firm. Capable organiser and specialist in:—(1) Heat-treatment of Alloy Steels; (2) Plant Lay-out; (3) the Design of Tool Equipment; (4) Mass production of interchangeable components; (5) Rotary Engine manufacture. Good production record.—Box No. 2043, The Aeroplane, 166, Piccadilly, W.1.

Works Manager seeks re-engagement with aircraft firm. Practical aero constructor of complete machines and spares. First-class organiser, strict disciplinarian, and thorough control of male and female labour through all departments.—Box No. 2026, The Aeroplane, 166, Piccadilly, W.1.

Tool-room Foreman or works superintendent, aircraft work, desires re-engagement. Well up in aircraft requirements, stampings, jigs, tools, engines, etc.—Box No. 2007, The Aeroplane, 166, Piccadilly, W.1.

FOR SALE.

Aeroplane Radiators.—The Gallay Radiator Company, Limited, stock Aeroplane Radiators, For the benefit of Constructors, can supply radiators for experimental purposes at a nominal cost. Advice given on suitable types for the various approved engines. Our drawing office is always at our clients' disposal.—198, Great Portland Street, London, W.1.

Warmth without Weight for chilly mornings. Light Shetland hand-knitted Jackets (Brown or Grey), 20s. Mention chest measurement.—Mrs. Loynes, 122, Oliver Street, Coventry.

A number of Mahogany and Walnut Aeroplane Propellers, unsuitable for service, but undamaged, are offered for sale, singly or in groups of six or more.

Samples may be seen on application to the Naval Store Officer, R.N. Air Depot, White City, W.12, to whom offers of purchase should be made.

Engineering Works (20 hands) for sale as a going concern, making aeroplane parts, 25 miles north of London.—Box No. 2041, The Aeroplane, 166, Piccadilly, W.1.

Tarpaulins for Sale.—Good second-hand railway truck sheets repaired and redressed, London Works.—Write for prices, Johnston, 12 Broughton Road, Croydon.

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AIRCRAFT PARTS.

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Wanted, mahogany, teak, and walnut cuttings from builders', railway, and aircraft works.—Box No. 2001, The Aeroplane, 166, Piccadilly, W.1.

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ON STANDARDISATION AND QUANTITY PRODUCTION.

Presumably all are agreed that the great need of the moment, aeronautically at any rate, is more and more aeroplanes. Those officially responsible for the Flying Services and the variously assorted critics of the Flying Services are at one on that point at any rate. As to how these multitudinous aeroplanes are to be produced is another question, on which there are as many opinions as there are men to hold them. Obviously the main road to procuring them is along the line of standardisation.

Therefore it is as well to have a clear understanding of what standardisation implies, for, like the blessed word Mesopotamia, standardisation appears to be to some people a consolation in all their afflictions. But standardisation is a thing which needs to be carefully handled, or it may become like unto the inspired schoolboy's definition of a lie, "An abomination before the Lord, but a very pleasing help in time of trouble." That is to say, standardisation as such may hold up output and result in obsolete aeroplanes being used on active service, and at the same time provide officials with an excuse for every kind of delay when taxed with their sins.

In other words, it is possible to have perfect standardisation without quantity production. On the other hand, it is impossible to have quantity production without standardisation, especially when quantities of the same thing are produced from a number of different sources.

A Revolutionary Publication.

It will be remembered that last week a paragraph was published in this paper, asking any firm which was in a position to render assistance in the production of aero-engines, or aero-engine parts, to communicate with "the Controller of Aeronautical Supplies, Room 355, Air Board Office, Strand, W.C.2." It is earnestly to be hoped that any reader of this paper who owns, or knows of, any workshop capable of turning out engine parts, and not already full up with war work, has already communicated the information to Room 355, and that if he, or she, has not already done so, the information shall be sent forthwith, on seeing this reminder.

I have no inside information as to this request by the Air Board, but on the face of it there seems to be, in the sending out of the notice, the excellent intention to adopt at last the *système globale* which has long been so successfully used in France for quantity production.

The Système Globale.

This system is in essence practically the same as that which existed in Coventry in the palmy days of the watch trade before automatic machinery killed individual enterprises. In those days every watchmaker had his own little workshop, and his whole family worked in it. He sent to the chief factory at regular intervals for his raw material, sheet metal for cases, rod, wire, blanks for gear wheels, strip for springs, and so forth, and worked them up into the particular part which was his speciality. In some cases these finished parts, after being delivered to the employer, were made up into sets and served out again to other individual workers, who took them home and assembled them into complete "movements," which were again returned to the employer in whose factory they were fitted into their cases, and tuned up, for sale, as a rule, to big London firms, who resold them as their own products at enormous prices.

Now naturally every part of those watches had to be standardised to a very fine pitch, finer by a good deal than A.I.D. limits on aircraft parts. But in those days the artist-artisan still existed to some extent, and the individual worker took a pride in his work, consequently fine standardisation was not difficult.

The industry was eventually killed by the importation of cheap French and American watches made from parts chewed out by the million on automatic machines. The Coventry watchmakers—with a few notable exceptions—were too conservative to adopt automatic machinery, and the workmen were too obstinate to consent to new organisation of output, and so most of the trade left the district. But the system itself was not to blame, for it only needed extending and modifying to suit new conditions.

The wool and linen industries were examples of the same system, wherein the hand-loom workers received their raw material from the central factory, and returned the manufactured article. In France the system existed largely in the motor trade at the outbreak of war. One would find, for example, a whole family employed in making carburettor floats. Mamma kept the accounts of material in, finished floats out, and wages in. Little Pierre chopped up the copper sheet roughly to the right size, little Jeanette cleaned it up nicely for soldering, big Jean bent it or pressed it to shape, and Papa performed the delicate operation of soldering up to precisely the correct standardised size and weight. There again you had standardisation and quantity production going hand in hand.

Ancient History.

It may remembered that over two years ago—on June 16th, 1915, to be exact—something very like this system was advocated in this paper as a means of increasing aircraft output. Naturally it was not suggested that every family should make little bits of aeroplanes, but it was suggested that the innumerable small engineering and motor firms sprinkled all over the country should be set to work to make aeroplane parts, drawing their material from central depôts in their dis-

tricts and delivering the finished parts to the same depôts, for distribution thence to the firms for whose aeroplanes or engines the parts were designed.

The system was then discussed in some detail, and if it had then been adopted our output would have increased very materially. Now, however, circumstances have altered considerably. Many of those little workshops have closed down, because they were despised as production units and could get no orders for Government work. In some cases workshops which really could have done good work, and offered to do it, were inspected by young gentlemen without factory experience, and turned down because they did not possess the kind of machinery these youngsters had been taught to regard as essential. In many cases the middle-aged men in such shops were called up for military service and turned onto less useful work.

I happen to know of one such small shop which was doing quite decent work on fuse-caps, and might equally well have made valve-caps or valves for engines. It was run by an old mechanic, a real artist as a turner, and a couple of youths. It closed down for lack of orders, and the last I heard of my friend the mechanic was that he was driving a motor lorry—a job on which he was absolutely wasted. Doubtless hundreds of similar cases could be found.

Present Possibilities.

Probably, therefore, these small shops are not now available. Nevertheless, there must be a large number of bigger establishments now at work on non-essential work, or on less essential work, which could be turned onto make engine and aeroplane parts, and one hopes that all will be roped in for the purpose. Practically any shop possessing a few lathes can help in the work of turning small parts, even if only in roughing out from the bar or from stamping, thus leaving the actual engine-maker's skilled men free to turn out greater quantities of finer work.

Similarly any shop where sheet-metal work is done—anything from art-metal work, as it is called, to making pots and pans—can be utilised for producing what the Aircraft Industry calls tin-clips.

The Difficulties.

The great difficulty is the proper organisation of the district depôts for raw material and for the redistribution of finished or partly finished parts. If any attempt is made to centralise all this work at the Hotel Cecil, or even in London, hopeless delay and confusion is bound to follow. Each district should have its own depôt, as an independent water-tight compartment, which would merely furnish its returns at regular intervals to the proper department in the Air Board. This would be in strict accordance with that system of decentralisation which is the only successful system in this country. Also, it is essential that the men in charge of these depôts should be accustomed to similar work. It would be no use making these jobs mere cushy things for invalided officers without business experience.

Essential Experience.

As I suggested in that article in 1915, the depôts should be run by men borrowed from such firms as Selfridge's, Harrod's, and the big Stores generally. In a place like Birmingham, for example, one would take a few men from one of those great furnishing firms in Corporation Street, where they are used to dealing in hardware from and to numerous small workshops and branch shops.

Old men with experience in this line would do the work perfectly, and the Services could afford to pay them well. And the whole system should be placed under the command of a young and energetic man who has already made his mark as a successful shopkeeper. If properly organised, the system may be made an immense success in augmenting quantity production, but if it is once allowed to be tangled up in centralisation it will cause infinite waste and delay.

A New Danger.

Above all, it is necessary that this modified *système globale*, organised to deal with quantity production of parts from small firms or ancillary firms, should not be allowed to interfere with the work of big firms who produce complete engines or aeroplanes, or other complete articles of aircraft equipment. Under this system it would be necessary for the minor firms employed to become practically wage-earners only, without power to buy or sell except from or to the Aeronautical Supplies Depôts. But it is most important that the big "complete article" manufacturers should not be tied down by any centralised system of buying.

Already one hears of dangerous delay in output caused by this, that, or the other department assuming control of certain essential commodities, and insisting on setting itself up as a kind of commission agent—without financial interests, of course—between the producer of the material and the manufacturer of the aeroplane. Timber has been "controlled" till the situation has become very serious indeed. The control of fabric has caused continual friction and delay and dissatisfaction all round. The official handling of the dope question, from the early quarrels over poisonous dope, and the use of various doping systems, to the control and allocation of materials for the manufacture of dope, has equally caused delay in production and annoyance to everyone concerned.

If we are to get the best results, it will be far better to put full responsibility for supplies and workmanship on the big firms whose position and experience fits them to take such responsibility, and judge them by results on the finished article. The various and multitudinous supply departments under the Air Board should be made to understand that they exist to assist and encourage quantity production and not merely to control supplies.

The mere word control has come to connote hindrance to progress. To control a horse implies keeping him under restraint. One loosens the reins when one desires extra speed or power output, and a very decided loosening of the reins is desirable if the Aircraft Industry is to put forth its maximum quantity production.

Standardisation as a Hindrance.

It may be well, at this point, to indicate how standardisation may become a hindrance to quantity production. To state a case briefly, one may standardise the manufacture of a jigsaw puzzle, each mis-shapen piece of the picture being stamped out mechanically so that it is exactly like the same piece in every other similar picture, but if one wants to produce that picture in the quickest and simplest way it is better to print it in one block.

Similarly one may standardise each and every part of a complicated aeroplane or engine to the last ten-thousandth of an inch, so that every part fits into its place perfectly, and yet the resulting machine may cost many times as much to produce in time and material and labour as it would cost to produce an equally efficient machine with fewer parts which were specially designed for quantity production.

For example, among the chief objections to all our officially designed aeroplanes have always been the facts that the parts have been difficult to make, so producing an undue proportion of "scrap" and consequent waste

of time and material, and that the design of the parts might easily have been simplified by anyone with experience of quantity production. These objections were constantly raised by manufacturers in the earliest days of the B.E.2c and the F.Es., and I gather that the R.Es. and S.Es. of to-day also contain unnecessarily complicated detail design.

All those complicated parts were beautifully standardised, in so far as each particular part came out exactly interchangeable with like parts, but the point was that the whole design might have been simplified so that the job of putting the machines together could have been done more quickly, and each part could have been simplified so that it by itself could have been made more quickly.

A Telling Caricature.

One designer, amazed by the official genius shown in giving intricacy to quite simple things, said to me one day that he believed that when the general design of an R.A.F. machine was done, it was brought into the main drawing-office, where the whole staff of draughtsmen fell upon it like a pack of wolves. Each draughtsman then seized a piece of detail design for himself, and carried it off to his own corner, where he spent the next month in twisting it about and mangling it till he had produced the most complicated possible piece of work, just to show how clever he could be.

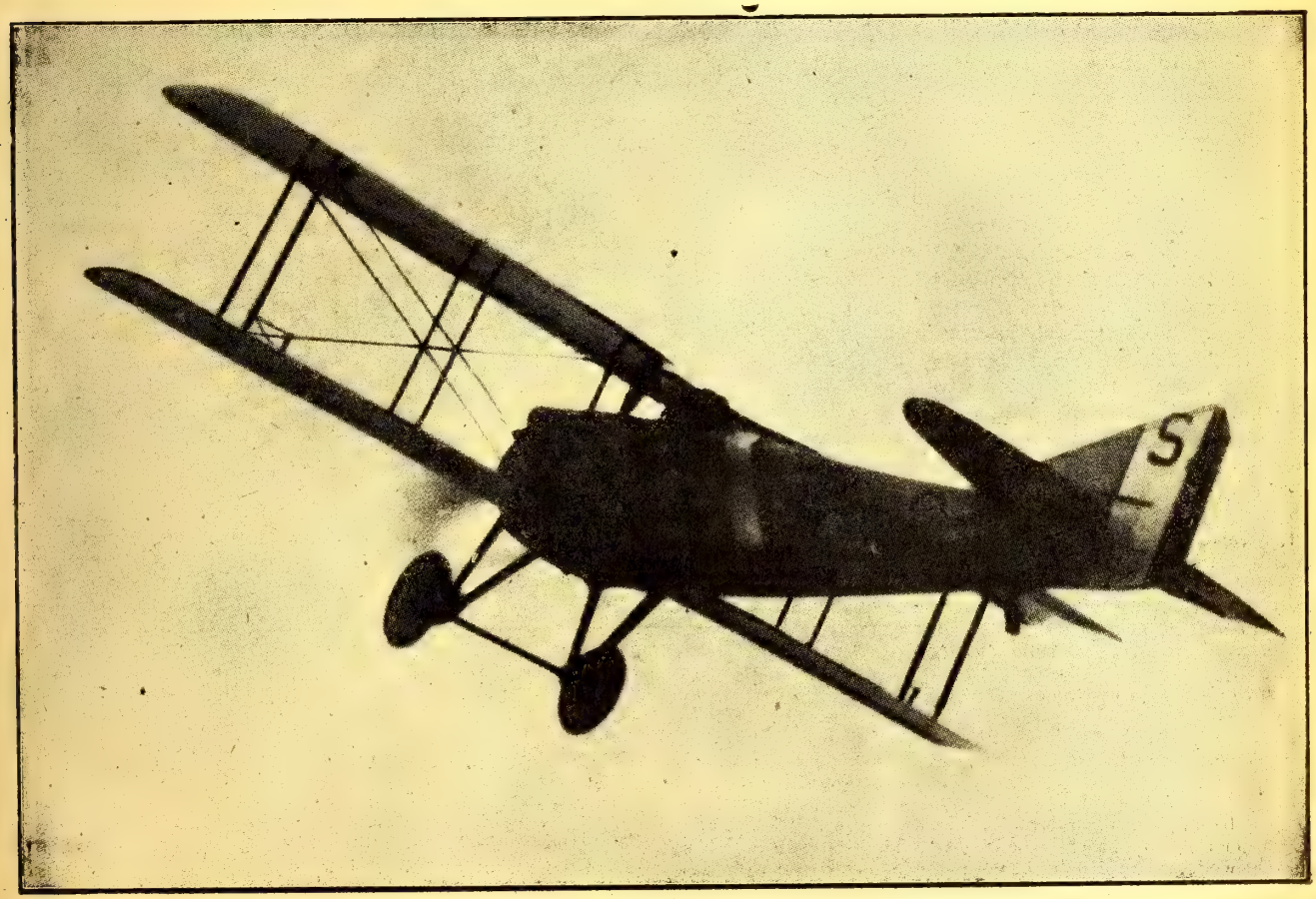
That, of course, is a libellous piece of caricature, but it certainly did seem fairly evident that the detail design of the R.A.F. machines was done without any view to quantity production in the light of workshop practice and manufacturing experience. And, naturally, workshop practice plus manufacturing experience are most important factors in designing aeroplanes and engines, either for war or commercial purposes.

Speed and Cheapness.

In war-time rapidity of output is just as important as is cheapness of output in commercial production. It is generally admitted that our best designs at any moment during the war have been six months ahead of the best enemy designs. It is even more important that our quantity production should be six months ahead of the enemy's, so that the majority of our active-service pilots may be better mounted than the majority of enemy pilots. There is no sense in having one or two of our star-turn fighters out at the front on experimental machines which can fly rings round the best Germans, if the bulk of our reconnaissance and bombing and artillery observation pilots are on machines which are very considerably out of date. That has been the case too often in the past, and the fact that great improvements have taken place of late months is no excuse for what has been in the past, nor is it any guarantee for the future, unless things that are known to be wrong are put right. It is unfortunate, from the official point of view, that improvements have always come after and not before public agitations. *Post hoc* is ever difficult to distinguish from *propter hoc*.

Type Standardisation.

One very favourite idea among those who are agitating for quantity production is that vast improvements may be effected by standardising on a few types of aeroplanes on active service. It is, of course, absolutely true that if we could afford to scrap all types of aeroplanes and engines except three or four of each, and could turn our whole energies onto producing those types, we should materially increase our output, and should at the same time simplify the work of supplying squadrons in the field with spares. But type standard-



Reproduced from "Aerial Age Weekly," New York.

THE S.P.A.D. SINGLE-SEATER.—A standard French fighting machine, which is also used considerably by other Allies.

isation is a most dangerous game to play with such immature products as aeroplanes and aero-engines.

If aircraft were anywhere near their ultimate stage of development it would be highly advisable to standardise, say, four types of machine—a small fast single-seat fighter; a bigger two-seat fighter; a general-purpose machine for reconnaissance, artillery observation, photography, and what one might perhaps call tactical or corps squadron bombing; and for the fourth type a very big, multiple-engined, self-protecting, long-range bombing machine, to operate in large fleets on purely strategic or political bomb-raids.

The German System.

To some extent the Germans are doing this, which is perhaps why so many Service people are inclined to do likewise. For example, the Albatros DIII type, commonly known as the "V strut" single-seater, is almost the only chaser type seen on the West front. Fokkers, Halberstadts, Rolands, and so forth are scarcely ever seen, except in the minor war areas. It is said, in fact, that the V strut Albatros constitutes something like 80 per cent. of all German machines in the West. The Gotha, except for a few A.E.Gs., seems to have a monopoly of the twin-engine bomber class. But the two-seater "general purpose" class is fairly cut up between Albatroses, Aviatiks, Rumplers, D.F.W.-Aviatiks, L.V.Gs., and the bigger Rolands, with the three first-named apparently the most numerous.

Obviously if all the chaser squadrons are on V strutters, it must simplify immensely the handling and equipment of those squadrons in the field. And similarly the "Bucharest" squadron of Gothas in Flanders must be easier to supply with spares so long as every machine is exactly like every other. But, all the same, type standardisation can be overdone.

A Diversity of Creatures.

A friend of mine, an ardent supporter of standarisation, told me with horror, the other day, that he was informed—whether rightly or wrongly I do not care to say—that we were then using something like twenty different types of machines on active service. Probably we are. If so, at least ten of them are out of date, and their continued use is an excellent proof of our wrong-headedness in the past. And if there are another dozen more or less up-to-date types in use, it is no more than there ought to be.

The consolation about having a variety of types is that, if the responsible authorities make a mistake over one type, other types exist which pull them through till the mistake has been put right. We made a mistake in trying to standardise on the B.E.2c., and the R.F.C. was saved by a weird assortment of French and British "trade" aeroplanes rushed through in a hurry. We made a mistake in standardising on the R.Es., and the authorities were then saved by de Havillands and Bristols and Sopwiths. We made a mistake in standardising on R.A.F. engines, both air-cooled and water-cooled, and the authorities have been saved by Clergêts and le Rhônes and Rolls-Royces and Hispano-Suizas—thanks to the Navy and not to the R.F.C. of the period when the mistake was made.

Stagnation of Design.

But let any experienced R.F.C. pilot try to imagine the state of affairs to-day if the authorities had been permitted to standardise solely on B.Es., F.Es., R.Es., and S.Es. as its four types, with R.A.F. engines and nothing else. And there is every reason to believe that such standardisation would have been put through but for continual agitation at the period, and constant criticism of officially designed aeroplanes and engines.

Also, it is well to remember that if those types had been standardised there would have been no new and improved types constantly coming along as there are to-day, simply because all incentive to design new types would have been smothered. The result would have been stagnation of design, and disaster to the R.F.C.

Trying Out.

As it is, new and approved types are put into use on active service, and, when tried and not found wanting, are ordered in large numbers. Only under such conditions can new designs be tried out effectively. Incidentally one is glad to find that the very latest things are not sent over the enemy's lines singly, as was our happy-go-lucky system in the past. It is now possible to tell with reasonable certainty at home whether a sample new machine is worth reproducing in small quantities, and trying out on active service, before ordering it by the thousand.

This excellent system makes imperative the use on active service of a number of different types at once. Three or four types exist in much greater numbers than the others, and as those predominating types die out they are succeeded by newer and improved types. Only thus can a constant supply of new and up-to-date machines be ensured, in accordance with Sir Douglas Haig's desire, expressed in his dispatch last Christmas. Consequently it would be not only unwise but impossible to standardise down to two or three types on active service, as is desired by so many excellent people at home and abroad, who have not sufficiently considered the problems of standardisation and quantity production.—C. G. G.

ESCAPED PRISONERS.

It is reported that two members of a Zeppelin crew have escaped from Stobs internment camp. Their descriptions are as follows:

Wilhelm Heinrich Jensen, naval warrant officer, Zeppelin, aged 38, complexion fair, hair dark, eyes blue, build normal, height 5 ft. 10 in., dress naval uniform.

Max Ammerlich, naval petty officer, Zeppelin, aged 29, complexion fresh, hair dark, eyes brown, build normal, height 5 ft. 11½ in., dress naval uniform.

Scotland Yard reports the escape from the Prisoners of War Camp, Holyport, Maidenhead, of two German officers, both flying men, whose intention is, if possible, to steal an aeroplane and fly back to their own country. Their descriptions are:

Lt. Josef Flink, aged twenty-three, height 6 ft. 1 in., complexion fresh, hair dark brown, eyes dark grey, slight build, dressed in uniform, but may be wearing flannel trousers. Mark gunshot wound, which shows in the palm of the left hand. Speaks very little English.

Orbum Alexander von Scholtz, aged twenty-two, height 6 ft., complexion shallow, hair dark brown, slight build, dressed in uniform, may be wearing flannel trousers. Dark side whiskers. Speaks very little English.

THE INGENIOUS PRESS.

Daily newspapers publish the following amusing report:—

Information has been received which, in a measure, explains the reason for the mysterious visitation of German aeroplanes over Holland and the bombing of Dutch villages on Saturday, August 18th. It would appear that a large squadron of German machines set out with the intention of raiding England, but turned back on reaching the coast owing to bad weather.

As a bombing machine cannot alight without having first disposed of its bombs, the would-be raiders proceeded to get rid of them; to do so over Belgium territory in the occupation of German troops might have resulted in the killing of Germans. They accordingly waited until over Dutch territory, where the possibility of killing was purely one of killing neutrals. Germany's conduct of submarine warfare has demonstrated her attitude towards such an eventuality; but it will be interesting to hear what plea she will put forward in support of this new law of "necessity."

[The explanation would be ingenious were it not for the fact that much of Holland is open country where bombs could be dropped without damaging anyone. The same remark applies to Belgium and the North Sea.—Ed.]

THE DEATH OF A PIONEER.

On August 25th, Harold Barnwell, one of the pioneers of British aviation, was killed in an aeroplane accident at Joyce Green, near Dartford.

For some time before his death Mr. Barnwell had not been in the best of health, and had had attacks of giddiness. Nevertheless, he went on flying, and flew with all his accustomed skill. On the morning of his death he had flown three machines from Brooklands to Farnborough, and after delivering the third had hurried to Farnborough Station to catch a train to town. He travelled straight through to Dartford, so far as can be ascertained without stopping for lunch.

When he arrived at the aerodrome Captain Barker, R.F.C., was flying a new and very successful experimental machine, of which Mr. Barnwell held a high opinion. After the machine had landed, Mr. Barnwell decided to take it for a short test flight himself. He went up to a height of several thousand feet, made two or three loops, then came down and did a speed test near the ground, and then went up to 2,000 ft. or so and put the machine into a right-hand spin. Nothing abnormal was noticed about the evolution, which the machine had performed before, but instead of flattening out to land the machine went on straight into the ground, and Mr. Barnwell was killed instantly.

Careful examination of the wreckage showed that all the control wires were intact. Captain Barker's evidence at the inquest and Mr. Barnwell's own flying showed that the machine had just previously been in perfect order, so the only possible explanation of the accident seems to be that Mr. Barnwell became giddy or fainted, an explanation which appears to be justified by preceding circumstances.

Mr. Barnwell was buried on August 28th at West Byfleet, his funeral being attended by representatives of the Services, in recognition of the good work done by him in the national interest.

Richard Harold Barnwell was born in London on April 3rd, 1879, and was educated in Scotland. After leaving school he was trained as an engineer at the famous Fairfield Works on the Clyde, and proved to be exceptionally able in all mechanical matters. Long before flying became a practical thing he began experimenting with aeroplanes, and in December, 1908, in partnership with his brother, Frank Barnwell—now Captain R.F.C., and one of our most successful aeroplane designers—he completed at their works at Stirling a monoplane with a double-opposed horizontal engine. The whole machine and its engine were built by the brothers at their own works, which are still flourishing under their original title of the Grampian Motor and Engineering Company. Though the machine did not fly according to modern ideas, it lifted from the ground, and so Harold Barnwell could claim to be the first man to fly in Scotland.

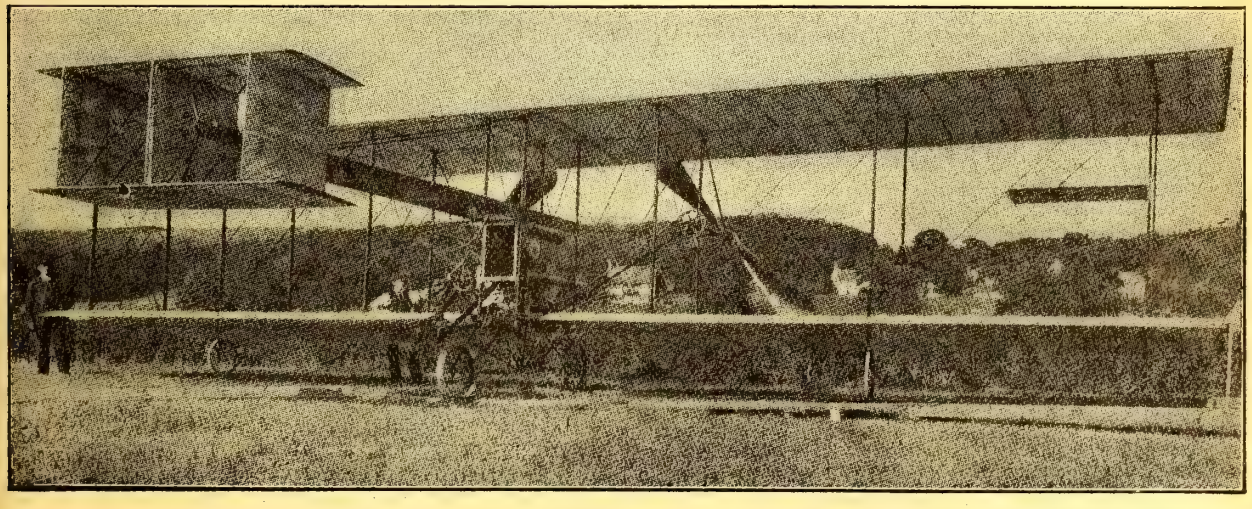
After a series of experiments this type was abandoned, and a big biplane was built of a modified Wright type, and on this Harold Barnwell made a flight of about 80 yards on July 28th, 1909. The machine had a span of 48 ft. and an 8 ft. chord with a 7. ft. 6 in. gap and a 3 in. camber, so that its wing dimensions accorded fairly well with modern ideas. Unlike contemporary biplanes, it had double-surfaced wings, which were covered with oil-proofed silk, and had a Phillips entry. The struts were described as "of torpedo section," and the stays "consisted of steel tape in order to reduce air resistance."

The engine was a 4 in. Tourist Trophy Humber, weighing complete 460 lbs., and it drove two propellers, 10 ft. diam. by 10 ft. pitch, by means of chains. These propellers also were built in the Grampian Motor and Engineering Co.'s works. Small stabilising planes were fitted, Curtiss fashion, between the wing tips. The total weight of the machine was about 14 cwt. without the pilot. Longitudinal control was effected by a biplane cellule elevator carried on two long fore and aft girders.

The first flight ended in a smash, without serious damage to the pilot. The machine was then repaired, and another flight was made on September 10th, 1909, which also ended in a smash, and convinced the makers of the machine that some kind of tail control was necessary.

Some time afterwards Harold Barnwell came to England to learn to fly, and joined the Bristol School. He took his certificate (No. 278, dated September 3rd, 1912) on a Bristol at Brooklands, and soon became known as a singularly skilful pilot. Later on he joined Captain Wood—as he then was—of Vickers Ltd., and took charge of the Vickers School at Brooklands.

As an instructor and school manager, few, if any, aviators have equalled Harold Barnwell, for his ability to impart knowledge was aided by a marvellously equable temper and a goodness of heart which endeared him to all his pupils. I doubt if anyone has ever seen Harold Barnwell really angry, and, though none suffered fools less gladly than he, a slight hint of boredom with



The Barnwell Biplane. Built at Stirling in 1908-09

their presence was the only mark of his displeasure which they ever perceived. Only on his intimate personal friends did Harold Barnwell ever let loose in argument the wealth of invective—and that of a highly literary character—of which he was capable. And then it was a pleasure to hear him, even to the victim of his scorn.

At the Vickers School Harold Barnwell taught the practice of aviation to many of the most notable pilots of the day, most of whom now hold high rank in the Services. He also made a practice of flying any other makes of machines when opportunity offered, so that his experience as a test pilot was of the highest value. Whether flying an old box-kite, a gun-carrier, a Sopwith tabloid, the big Martinsyde monoplane, or the various Vickers experimental machines, his skill and judgment were equally evident. Few will forget his great race on the Martinsyde with the late Gustav Hamel on his racing Morane in the "Circuit of London," when he was only beaten by seconds over the long course.

After the outbreak of war he moved to the Vickers Aerodrome at Joyce Green, and continued to test machines of all sorts. Many were his adventures with experimental machines, both at the aerodrome and on cross-country flights, but in spite of several narrow escapes, including an unintentional loop on a two-ton fighting machine, which finished the loop on the ground, he never came to serious harm.

Besides testing, he did a certain amount of designing, and the tiny scout which he designed and built at Joyce Green was the fastest machine of its day. For various reasons, sufficient at the time, it was not adopted as a standard Service type, but it displayed so much promise that it was recently arranged that he should take up designing as his chief occupation, and leave the firm's regular testing work to others. Like his brother Frank, he possessed exceptional ability as a designer, and his untimely death will undoubtedly deprive the Services of many valuable improvements in aeroplane design.

If Harold Barnwell had been possessed of any particular ambition, there is no telling to what high position his natural abilities might have carried him, but he was obsessed by an invincible contentment with his lot, and could not be induced to struggle with his fellows in the race for what is commonly supposed to be success in life. Which was just as well for the other competitors, albeit a loss to aeronautical progress.

For all his pioneer work and his great skill as an engineer and a pilot, he was known to few, except those with whom his daily work brought him in contact. The daily news-sheets, with that inaccuracy of statement for which they are famous, have said that "before the war" he was "a well-known figure at flying competitions and displays." Never was a description more false, for Harold Barnwell was a gentleman of the old school, and nothing less like a well-known figure or an habitual participator in public displays can be imagined. Fame, notoriety, publicity, call it what you will, were hateful to his shy and proud disposition, and when in the course of his employers' business he had to fly in public he expended successfully considerable ingenuity in avoiding the clutches of Press photographers, with the result that not one likeness of him exists.

He flew because he liked flying, and because he wanted to know more about aeronautics, though, being possessed of a comfortable income, he had no need to fly for a living. He was entirely a fatalist, and for that reason he flew cheerfully under conditions which would have stopped others from flying. Of late he had frequently expressed the conviction that he was going to be killed before long, but the foreboding did not seem to depress him at all. He seemed merely to accept it as a fact which could not be helped, and he thought it was not worth worrying about anyway.

There were those who thought otherwise, and besought him to exercise more care as to when, where, and what he flew, for though his skill was as great as ever he had reached an age when a man is not physically suited to be the pilot of the fastest and most tricky machines. Also, his great experience and ability made him of far greater value on the ground than in the air. And, moreover, though his retiring nature prevented him from being what is usually known as popular, he had acquired, without seeking, a number of friends to whom he had endeared himself deeply, and they were firmly of the opinion that his safety was well worth consideration.

However, he died as he expected to die, in the course of the duty he had laid down for himself—namely, the acquisition of knowledge for the improvement of aeroplanes. He desired that knowledge for the common good, and not for his own advancement or profit. Others who have died in acquiring knowledge for the benefit of humanity have been canonised as the martyrs of science. Among them none is more worthy to hold an honoured place than is Harold Barnwell.—C. G. G.

AIR RAID WARNINGS.

It is notified for the information of the public that in the event of enemy aircraft being likely to approach London by daylight warning will be given in the L.C.C. fire brigade and county area by the discharge of two one-pound naval explosive rockets, with an interval of 15 seconds between, from the look-out towers of the following fire stations:—

In the West End District.—From the stations at Manchester Square, Westminster, Knightsbridge, Brompton, Fulham, Hammersmith, North Kensington, Belsize (St. John's Wood), Hampstead, Shepherd's Bush, Bayswater, and Kilburn.

In the Central and North London Districts.—From the stations at Clerkenwell, Caledonian Road, Highbury, Great Marlborough Street, Euston, Kentish Town, Hornsey Rise, Hornsey, and Brunswick Road.

In the North-Eastern and Eastern Districts.—From Stoke Newington, Bow, Millwall, Poplar, Kingsland, Shadwell, Bethnal Green, Shoreditch, and Bishopsgate.

In the South-Eastern District.—From New Cross, Deptford, Woolwich, Greenwich, Shooter's Hill, Charlton, Lewisham, Dulwich, Peckham Road, Lee Green, Perry Vale, Eltham, Plumstead, and Cherry Garden station, Rotherhithe.

In the South-Western and Southern Districts.—From Clapham, Old Kent Road, West Norwood, Brixton, Tooting, Kennington, Wandsworth, Battersea, Streatham, Vauxhall, Waterloo Road, and Tooley Street.

Signals will also be fired from Scotland Yard, from the Blackfriars Bridge river float station, and from police stations outside the fire brigade area, but within 10 miles of Charing Cross.

THE MOSAIC LAW.

At a meeting of the Southend Town Council on August 21st a resolution was passed calling on the Government to state plainly whether or not they intend to take the necessary action to inflict reprisals on German civilians for air raids, and, if the answer is in the affirmative, to give an assurance that the engineering of the scheme of reprisals will leave little room for doubt that German civilians shall suffer to as great an extent as civilians in England have suffered.

[Anyhow, we have now got rid of some of our hypocrisy, and have evidently come back to the good old Mosaic Law.—Ed.]

AIR RAID RESULTS.

Below is a list of properly organised raids by enemy aeroplanes during the year. Sporadic raids by single machines, by a few not in regular formation, are omitted. The details are as follows:—

Date.	Locality.	Number of Raiders.	Brought down.	Casualties. Killed.	Injured.
May 25	Folkestone	16	3	76	174
June 5	Medway	18	10	12	36
June 13	London	15	—	157	432
July 4	Harwich	12-14	2	11	26
July 7	London and Isle of Thanet	20	4	37	141
July 22	Harwich and Felixstowe	15-21	1	11	26
Aug. 13	Southend	16	1	32	43
Aug. 22	Kent	10	2	11	13

IN DEFENCE OF GOVERNMENT OFFICES.

BY "BERKELEY."

There are more than one point of view in every question. The terms "right" and "wrong" can be qualified until no vestige of original meaning is left to gladden the debater or the seeker after truth. One is so prone to ignore all things that do not support one's own view that the other side to a question is lost in obscurity.

Eve is commonly held up to reprobation for her part in the incident, or series of incidents, which led to the exclusion of her husband and herself from the primeval earthly paradise and its langorous security. Her view has received little attention. So little, in fact, that only her accusation of temptation by the man Adam has survived in evidences.

Perhaps, if one knew the truth, it would appear that Adam, suffering intensely from ennui, owing to constant inaction of his guarded life, to which no gilded vice gave vivid relief, became unbearable to his adorable and unsophisticated wife. She, that pleasure might return again to his days, sought for amusements previously unknown in Eden. The result of her action is known to the world.

Such might be her side of the story. Yet an unbelieving world imputes to her the entire blame, and gives her no credit for the increase of production of the passing ages.

A Regrettable Incident.

Later in the tale of history one Guido Foulkes, or Fawkes, attempted to remove the Houses of Parliament and their human contents by means of an explosion of gunpowder. The attempt failed, and Guy Fawkes is remembered by all true Englishmen with feelings of sorrowful regret.

Here again one is too ready to impute a virtuous intention to him without considering the point of view proper to the members of the two Houses concerned. They also were doing their duty as seemed best to them. If they did no good, at least they did but little harm. Kill them, and they would of necessity be replaced immediately by others equally futile, equally verbose.

And so throughout all time there are at least two sides to everything, two views in every case. Each murderer can support his action by some reason, however inadequate it may be. Consequently a Government department possessing few friends among the people has a case to present if only public propriety permitted a reply to attacks.

A Case in Point.

The columns of this print have been largely devoted during the past few years to a series of direct attacks on certain Government departments connected with the design and output of aircraft. Aeronautics was a new science, and its military application involved changes and developments in other arms of the King's Services in addition to modifications in the design and material of the aircraft supplied for Government use. None knew very much as to the intricacies of the new science, and such knowledge was practically non-existent in either the War Office or the Admiralty.

The class of man who had entered the ranks of the new industry was rarely suitable for appointment either to the Civil Service or to commissioned rank in the Army or Navy. Hence it became necessary to form new departments from people, already in Government employ, who were possessed of such training as would permit their ready acquisition of such knowledge as was available, supplemented by suitable additions from outside sources.

Shifting the Blame.

There is little question that many bad selections were made, and that, as is commonly the case in the genesis of a new subject, innumerable mistakes were made, some being of high moment. The lack of preparation at the beginning of the war is a thing apart, and can in no way be blamed on the departments concerned or on the responsible officers commanding the aerial arms of the two Services. Inadequate supplies and a shortage of money must be laid to the charge of the executive government itself. The blame is invariably misplaced in these matters.

At the beginning of the present war the allowance of machine-guns to each battalion, as shown in establishments, was very low. The Germans, on the other hand, had equipped each infantry battalion with sixteen machine-guns of the latest pattern, and had trained exhaustively a large and efficient personnel in the tactical use of these weapons.

As a result, the casualties to British troops in the early stages of the war were unreasonably high when considered in relation to the numbers of the troops by which they were caused. Also, victory was denied us on many occasions, when tactical dispositions had given us the advantage, because the enemy possessed and made effective use of many machine-guns.

This shortage of machine-guns in our Army was again held as an offence of the War Office. The antiquated methods of that department were held up to ridicule.

Those Politicians.

But not a word was said as to the sins of the politicians who had for years refused the just demands of the responsible soldiers, because, forsooth, all increase of material would cost money, and fresh expenditure would send up national taxation, with a consequent increase of annoyance in the country. For years an increased establishment of machine-guns had been recommended, and for years it had been refused. The English Army was only intended for the decimation of savage races, and the existing preparations were adequate for that purpose!

So, too, in the case of mechanical transport and in that of the supply of horses. The departments might recommend, but the politician was afraid of his democratic supporters, to whom Old Age Pensions are a greater boon than national security, and the union of labour a more pleasing thing than an efficient measure of national defence.

The Defenceless Department.

The politician can defend himself, and the Service department cannot. Even on those occasions when the politician finds it necessary to answer charges in the House of Commons directed against any Government office, it happens frequently that a real defence is impossible owing to the risk of assisting the enemy by making the necessary revelations. Thus the unfortunate department, weakly defended, falls into greater disrepute than before.

There is a great charm to some people in a comparison between the amazing efficiency of a successful business house and the historic ineptitude of any office under Government control. It is so easy to speak of the enormous dividends issued by firms selling petrol or acting as universal providers of everything from hair-curlers to dinner guests. Compared with the constant unreturnable expenditure of officialdom, the glow of life is ever with the homes of petty business.

"Bithneth ith Bithneth."

A business house depends for its success on the sale of its goods. Its policy is largely indicated by the demands of the public. If the sale of elephants declines, the stock need not be replenished, and the money thereby saved can be devoted to an increase in the stock of perambulators, which may be in greater demand.

The efficiency of the employees in a business house is ensured by their individual keenness to make money and to progress in life. A Government official, if he effects a deal involving the expenditure of four or five millions of pounds, which in effect saves the country an enormous amount of annual expenditure, receives no personal advantage either in money or position.

He cannot be paid, as he is simply an honourable gentleman doing his duty in the proper manner. He cannot be promoted because over him are others who by longer service have earned their place in the world, and who have perhaps been denied the opportunity of completing an act of brilliancy.

Accessory Effects.

Again any business house, however vast may be its ramifications, is never so large as to prevent complete knowledge of the conditions affecting each bargain or sale. There are no correlated factors which complicate the decision. When they order a number of steam ploughs it is not necessary for them to consider whether such an order will reduce the number of motor-cars to be supplied in the immediate future.

In the case of a Government department, every act they carry out affects to a greater or lesser degree a number of other departments, and in the preliminary enquiry it is necessary to take all these conflicting factors into account.

The Case of Machinery.

For instance, one often hears of an application made by a firm undertaking the manufacture of munitions of war for permission to purchase additional machinery which is known to be in existence in the premises of another firm situated at no great distance from the applicant. The application is held up for days, though no other disposition is made of the idle machinery. The finger of scorn is pointed at the department which has by its apparent ineptitude caused needless delay.

A little reflection will, however, indicate the department's reasons for delay. It is possible and probable that the machine lying ready for delivery is of a nature suitable for use in industries controlled by other branches of the Government, and may have already been earmarked or allocated for issue to another firm.

That no confusion of effort may arise, a minute has to be sent round to these other departments in order that their views may be obtained as to the relative value of the different claims for the use of the machinery.

Each department is probably dealing with hundreds of questions daily, and is constantly making decisions covering not only the expenditure of millions of pounds but the wasting or saving of thousands of lives in the field. Is it extraordinary that a little time should be taken in the consideration of such matters?

Prevailing Amateurism.

Mistakes are made in innumerable cases, and a suffering public is not permitted to miss any of the horrors of mismanagement. The daily Press makes certain that all mistakes shall be magnified and imputed to the wrong causes. But on how many occasions is the public told of the constant tale of efficiency and of the unending successes made in spite of a prevailing amateurism.

Pages and pages could be covered with instances proving the hidden virtues of the much-abused Government official and of the mistakes of the critics. It would serve no good purpose so to blacken the pages of this journal, firstly because it would interest nobody, and secondly because none would believe the statements made therein.

The belief in the inefficiency of our permanent Government is too deeply ingrained for any well-balanced platitudes to make any alteration of value in public opinion. But, when cursing the official, spare one kindly thought for his good intentions, without which Hell would be denied its smooth and perfect floor.

Epilogue.

[My dear Berkeley,—I quite agree with you. Permit me to remind you that the people whom I have always cursed are not the real sailors and soldiers and Civil Servants, but the politicians—in and out of uniform.—Ed.]

Accidents in Home Service Flying.

There seems to be at present considerable uneasiness among many people on account of the number of fatal accidents reported in the daily Press as happening to aviators on home service. It is, unfortunately, impossible in war-time to publish figures showing the number of fatal accidents in proportion to the number of pilots flying and the number of miles flown, but if it were possible to publish those figures that uneasiness would disappear.

Accidents among those at home occur to three classes of aviators: (a) those in training, including instructors, pupils just learning to fly, advanced pupils, and pupils at fighting schools; (b) Home Defence pilots, and (c) active service pilots with squadrons preparing to go abroad.

The majority of the accidents occur in class (a). It is inevitable that under the necessary intensified training of war-time there should be a slight increase in accidents owing to pupils being pushed forward more quickly than they would be in peace time. Such accidents are as inevitable as are mental breakdowns among youngsters cramming for exams. These accidents are caused by pupils losing their heads at critical moments through inexperience, and sometimes by sheer stupidity. Sometimes a pupil only kills himself, sometimes he kills his instructor as well.

Accidents among advanced pupils are less frequent, and are as a rule true unavoidable accidents, through engine failure at inopportune moments, or through sudden changes in weather such as a quickly rising storm or an unexpected fog. Accidents at fighting schools are still less frequent.

Class (b) accidents happen as a rule through landing in the dark or in morning or evening fogs when practising, and sometimes after a flight in search of enemy aircraft.

Class (c) accidents are probably the least frequent of all, and, one imagines, are caused either by collisions, carelessness in flying when "stunting" near the ground, or by machines breaking in the air when flying for practice.

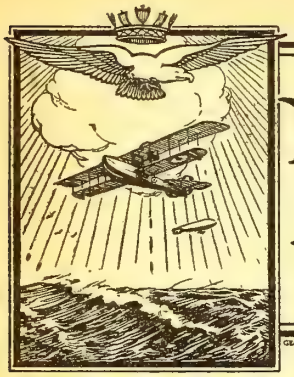
The system of training is now so skilfully graduated, despite the urgent demand for pilots, that very few undue risks are taken. Here and there a local C.O. may demand too much of his pupils and instructors, and so may cause a few extra accidents, especially when he is himself pressed to supply a certain number of pilots during a spell of bad weather, but it may be taken as a fact that every possible care is exercised to avoid such accidents. In any case the number of fatalities is astonishingly small in proportion to the number of pilots and their mileage, though the majority of the net total must necessarily be among pupils.

The really avoidable accidents are chiefly caused by young and exuberant pilots showing off, or "stunting," for the admiration of their friends. One can have but little regret for those killed from such a cause.

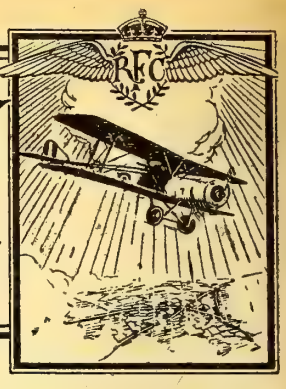
Some other avoidable accidents are caused through bad workmanship either in new or repaired machines. None can forgive those who are responsible for such accidents and one hopes that if convicted they are dealt with sufficiently severely.

There is, however, still a feeling that of those accidents which continue to occur on R.E.8s. some are avoidable. There is, for instance, no excuse for spars breaking in the air, nor for engines setting fire to the machines, either on or off the ground, and it would seem that such happenings are not so uncommon as they should be. It is well that these accidents should be studied still more closely.

Apart from these specified causes of accidents, one may rest assured that, considering all the high pressure of war-time training, the number of fatalities is not disturbingly high, and it would not be surprising to find, if one could take a percentage of accidents to the numbers of pilots and their mileage, that the proportion is actually considerably lower than it was before the war.—C. G. G.



NAVAL and MILITARY AERONAUTICS



FROM THE "LONDON GAZETTE."

Admiralty, August 16th.

Aug. 17th.—Proby. Flt. Comdr. to be Flt. Comdr. :—M. C. Brotherton, July 18th.

Proby. Flt. Sub-Lt. to be Flt. Lt. :—A. C. Jelf, July 3rd.

Aug. 18th.—Lt.-Comdrs. graded as Flt. Comdrs. :—W. Pennefather, G. G. H. Cooke, July 4th.

Aug. 20th.—To be temp. Flt. Comdr., R.N. :—N. C. Blanch, June 30th.

R.N.A.S.—Flt. Sub-Lt. to be Flt. Lt. :—G. S. Greenland, July 15th.

War Office, August 21st.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing.—Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld. :—Lt. C. W. Carleton, Spec. Res., Aug. 4th. Lt. H. D. Williams, Spec. Res., Aug. 7th.

Schools of Aerial Gunnery.—Chief Instr.—Graded as a Sqdn. Comdr.—Temp. Capt. A. R. C. Cooper, Gen. List, from a Chief Instr. (graded as a Flt. Comdr.), and to be temp. Maj. whilst so empld., July 19th.

* * *

The King has been pleased to award the Military Medal for bravery in the Field to the following non-commissioned officers and men :—

13230 1st Cl. Air Mech. G. W. Nelson, R.F.C.
9176 1st Cl. Air Mech. M. V. Pocock, R.F.C.
65088 Sgt. F. Reeday, R.F.C.
79004 Cpl. F. Woodward, R.F.C.

* * *

The King has been graciously pleased to award the Meritorious Service Medal to the following non-commissioned officers and men for gallantry in the performance of military duty :—

Australian Imperial Force.

532 2nd Cpl. (Air Mech.) T. J. Carmody, A.F.C.
666 Sgt. A. G. Dalzell, A.F.C.
630 1st. Cl. Air Mech. C. M. T. Lee, A.F.C.
684 1st Cl. Air Mech. V. Smith, A.F.C.

War Office, August 22nd.

REGULAR FORCES.—Staff.—Temp. Appts. at the War Office.—G.S.O., 3rd Grade.—Capt. S. O. Everitt, Res. of Officers, from a Staff Officer, 3rd Cl., R.F.C., vice Capt. Sir N. R. A. D. Leslie, Bt., Ind. Cav., July 23rd.

Establishments.—R.F.C.—Mil. Wing.—Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld. :—Sec. Lt. (temp. Lt.) C. D. Fellowes, Yeo., T.F., June 6th. Temp. Lt. G. M. Clarke, Leins. R.; Lt. J. E. Evans, R.W. Fus.; Lt. W. M. Pethybridge, Spec. Res.; Sec. Lt. C. J. Campbell, Spec. Res.; Sec. Lt. G. F. Hughes, Spec. Res., July 29th. Temp. Lt. E. R. Tempest, Gen. List; Lt. P. D. Robinson, Spec. Res., July 30th. Temp. Lt. L. R. Wren, York. and Lanc. R.; Sec. Lt. (temp. Lt.) D. D. G. Hall, M.C., York R.; Lt. J. F. A. Day, Spec. Res.; Lt. A. H. G. Fellowes, Spec. Res.; Lt. W. Buckingham, M.C., Spec. Res., July 31st. Lt. A. H. Vinson, Spec. Res.; Sec. Lt. C. Musgrave, Spec. Res., Aug. 1st. Sec. Lt. (temp. Lt.) G. K. Macdonald, Notts and Derby R., Spec. Res.; Lt. W. S. Shirtcliffe, Spec. Res.; Sec. Lt. C. N. Russell, Spec. Res., Aug. 2nd.

Equip. Officers, 1st Cl.—And to be temp. Capts. whilst so empld. :—Lt. L. W. W. Lees, R.G.A., Spec. Res., from Staff Lt.; Temp. Sec. Lt. S. R. Axford, Gen. List, from the 3rd Cl., Aug. 1st.

* * *

The following are among the decorations and medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign. The King has given unrestricted permission in all cases to wear the decorations and medals in question.

PRESENTED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

Legion d'Honneur.

Croix d'Officier.

Brev. Lt.-Col. Duncan Sayre MacInnes, C. M. G., D.S.O., R.E.
Brev. Lt.-Col. Duncan Le Geyt Pitcher, Indian Army.

Croix de Chevalier.

Maj. John Laurence Baird, C.M.G., D.S.O., Yeomanry.
Temp. Lt.-Col. William Dawson Beatty, Royal Engineers.
Col. (temp. Brig.-Gen.) Walter Buckingham Caddell, R.A.
Temp. Hon. Col. John Dewar Cormack, C.M.G.
Actg. Maj. William Middleship Cooper, M.C., R.A.
Brev. Lt.-Col. John Tuthill Dreyer, D.S.O., R.A.

War Office, August 23rd.

REGULAR FORCES.—N.C.O., to be temp. Sec. Lt. :—

Memorandum.—For duty with R.F.C.—Sgt. C. H. N. Nunn, from R.F.C., July 2nd.

Establishments.—R.F.C.—Mil. Wing.—Sqdn. Comdrs.—From Flt. Comdrs., and to be temp. Majs. whilst so empld. :—Sec. Lt. (temp. Capt.) E. M. Pollard, W. York. R., T.F., March 16th. Sec. Lt. (temp. Capt.) R. H. Peck, E. Surr. R., Aug. 1st. Temp. Capt. W. D. Long, Gen. List, Aug. 2nd. Capt. T. W. Mulcahy-Morgan, R. Ir. Fus., Aug. 7th. Capt. (temp. Lt.-Col.) E. N. Fuller, Spec. Res., to revert from a Wing Comdr., to relinquish his temp. rank and to be temp. Maj. whilst so empld., Aug. 4th, seny. Sept. 5th, 1915.

Flt. Comdrs.—Capt. K. B. Harbord, R.A., from a Staff Officer, 2nd Cl. (graded as a Brig.-Maj.), School of Aerial Gunnery, July 16th. From Flying Officers, and to be temp. Capts. whilst so empld. :—Sec. Lt. (temp. Lt.) C. Butler, R.E., T.F.; temp. Lt. H. G. Smart, Gen. List; Sec. Lt. J. Manley, Spec. Res., July 23rd. Lt. A. W. Kilgour, Spec. Res. (since killed), July 26th. Temp. Lt. A. C. Jowett, Gen. List; temp. Lt. S. W. Thompson, Gen. List; Lt. G. E. F. Sutton, M.C., Canadian Local Forces; Lt. E. Cameron, Yeo., T.F.; temp. Lt. J. A. Slater, Gen. List; Lt. E. J. Watkins, Spec. Res.; temp. Sec. Lt. R. W. Chappell, Gen. List, July 27th. Lt. J. Whittaker, E. Lan. R., T.F.; Sec. Lt. (temp. Lt.) A. G. Taylor, Yeo., T.F.; temp. Lt. J. H. Metcalf, Gen. List; Lt. G. J. Harter, Spec. Res.; temp. Lt. J. L. Trollope, Gen. List, July 28th. Temp. Lt. L. S. Weedon, Gen. List, Aug. 6th. Sec. Lt. C. S. O'Grady, Spec. Res., Aug. 11th.

Equipment Officers, 1st Cl.—And to be temp. Capts. whilst so empld. :—Lt. L. E. Palmer, York. and Lanc. R., from an Equipment Officer, 3rd Cl., June 11th. Sec. Lt. (temp. Lt.) L. V. Drake, Yeo., T.F., from an Asst. Inspr. (graded as an Equipment Officer, 2nd Cl.), School of Mil. Aeronautics, and to be temp. Capt. whilst so empld., July 1st. Sec. Lt. (temp. Lt.) H. E. Jarman, Spec. Res., from an Asst. Instr. (graded as an Equipment Officer, 2nd Cl.), School of Mil. Aeronautics, July 11th.

Gen. List.—Sgt. W. Lienard, from R.F.C., to be temp. Sec. Lt., Aug. 24th.

War Office, August 24th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing.—Flt. Comdrs.—From Flying Officers, and to be temp. Capt. whilst so empld. :—Temp. Lt. W. St. J. Scott-Scott, Gen. List (August 8th); Lt. N. H. Read, Spec. Res., August 10th.

Equip. Officers, 1st Cl.—Temp. Lt. P. Worthington, M.C., Gen. List, from a Balloon Comdr. (graded as a Balloon Officer), and to be temp. Capt. whilst so empld., August 1st.

Gen. List.—Flt. Sgt. G. G. L. Blake, from R.F.C., to be temp. Sec. Lt., July 17th. To be temp. Sec. Lts. (on prob.) :—H. T. Kingsley, late temp. Sec. Lt., Worc. R.; H. A. Lyford, August 24th.

Schools of Instr.—School of Aerial Gunnery.—Comdt.—(Graded as a Depot Comdr.)—Temp. Lt. (temp. Maj.) G. R. Moser, Arg. and Suthd. Highrs., from a spec. appt. (graded as a Park Comdr.), and to retain his temp. rank while so empld., August 1st.

The King has been pleased, by Letters Patent under the Great Seal, to create and institute an Order of Knighthood to be styled "The Most Excellent Order of the British Empire."

The Order follows in most respects the precedents of other Orders of Knighthood, but it will consist of five classes, and will be given to women as well as men. The first two classes will, in the case of men, carry the honour of Knighthood, and in the case of women the privilege of prefixing the title "Dame" to their names. The Five Classes of the Order are as follows:—

MEN.

1. Knights Grand Cross (G.B.E.). 2. Knights Commanders (K.B.E.). 3. Commanders (C.B.E.). 4. Officers (O.B.E.). 5. Members (M.B.E.).

WOMEN.

1. Dames Grand Cross (G.B.E.). 2. Dames Commanders (D.B.E.). 3. Commanders (C.B.E.). 4. Officers (O.B.E.). 5. Members (M.B.E.).

The Badge of the Order, worn by the members of the 1st, 2nd, and 3rd Classes, takes the shape of a silver gilt cross, enamelled pearl grey, in the centre of which, in a circle enamelled crimson, is a representation of Britannia seated. The circle contains the motto of the Order, "For God and the Empire."

The Star, worn by members of the first two classes, is an eight-pointed silver star, the centre of which bears the same device as the Badge.

The treatment of the Badge for the 4th Class is similar to that for the 1st, 2nd, and 3rd Classes, except that it is smaller and is not enamelled. In the case of the 5th Class the Badge is of silver instead of silver gilt.

A Silver Medal of the Order has been struck and will be awarded to those persons, not being members of the Order, whose services to the Empire warrant such recognition.

As in the case of other Orders, the members will have the privilege of placing the initials (above indicated) after their names.

The Chancery of the Order will be at the Central Chancery of the Orders of Knighthood, St. James's Palace.

THE ORDER OF THE BRITISH EMPIRE.

[The King has been pleased to Command, as Sovereign of the Most Excellent Order of the British Empire, that the following persons concerned with aeronautics shall be admitted to the Order in the classes mentioned]:—

KNIGHT GRAND CROSS.

Lord Sydenham, G.C.M.G., etc.—Has rendered special services in connection with the Air Board and also as Chairman of a Royal Commission on Public Health.

KNIGHTS COMMANDERS.

Herbert Austin, Esq.—Has rendered valuable services in the production of the Munitions of War.

Dugald Clerk, Esq.—Member of the Panel of Board of Invention and Research, Admiralty, Member of the Ministry of Munitions Inventions Department, Member of the Trench Warfare Advisory Panel.

Alfred Edward Herbert, Esq.—Deputy Director-General in charge of the Machine Tool Division and Chairman of the Machine Tool Committee, Ministry of Munitions.

COMMANDERS.

Leonard Bairstow, Esq., F.R.S.—Chief of Aero-dynamics Department, National Physical Laboratory.

Charles William Bryant, Esq.—Managing Director of Brotherhoods (Limited.)

Lieut.-Col. Henry Fowler.—Late Director in the Gun Ammunition Division, Ministry of Munitions.

Percy John Pybus, Esq.—Has rendered valuable services to the Labour Supply Department of the Ministry of Munitions.

MEMBER.

Russell Clarke, Esq.—Aviation Electrician, Telegraphist, etc., Admiralty.

WAR OFFICE, August 25th.

REGULAR FORCES.—STAFF.—ATTACHED TO HEADQUARTER UNITS.—Capt. J. R. W. Grove, R. Dub. Fus., from a Balloon Officer, and to remain secd., vice Maj. M. R. W. Foster, Hamps. R., August 10th, 1917.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Sqdn. Comdr.—Sec. Lt. (temp. Capt.) W. R. Snow, M.C., Spec. Res., from a Flt. Comdr., and to be temp. Maj. whilst so empld., August 16th.

Special Appt.—(Graded as a Sqdn. Comdr.).—Lt. (temp. Lt.-Col.) H. E. Chaney, Lan. Fus., from Comdt. of a School of Aerial Gunnery (graded as a Depot Comdr.), to relinquish his temp. rank, and to be temp. Maj. whilst so empld., August 1st.

Flt. Comdr.—Sec. Lt. (temp. Lt.) W. R. B. McBain, R.F.A., T.F., from a Flying Officer, and to be temp. Capt. whilst so empld., July 26th.

Adjts.—Capt. E. C. Perrin, Ches. R., T.F., from a Flying Officer (observer), May 17th. Sec. Lt. C. H. Bell, Spec. Res., from a Flying Officer, and to be temp. Capt. (without the pay and allowances of that rank) while so empld., August 9th.

Equip. Officers, 1st Cl.—Lt. V. F. P. Bryce, Spec. Res., from the 2nd Cl., and to be temp. Capt. while so empld., May 14th.

Special Appts.—(Graded as Equip. Officers, 1st Cl.).—Lt. (temp. Capt.) V. F. P. Bryce, Spec. Res., from an Equip. Officer, 1st Cl., and to retain his temp. rank while so empld., June 22nd. Lt. F. D. Maclean, R.A., from an Equip. Officer, 3rd Cl., and to be temp. Capt. while so empld., July 5th. The appt. of Lt. V. F. P. Bryce, Spec. Res., notified in the "Gazette" of August 11th, is cancelled.

REGULAR FORCES.—OVERSEAS CONTINGENT.—Temp. Capt. C. E. B. Corbould is secd. for duty with the R.F.C., Jan. 31st.

* * *

The King has been pleased to approve of the appointment of the following Officer to be a Companion of the Distinguished Service Order in recognition of his gallantry and devotion to duty in the Field:—

Temp. Lt. Fred Parkinson Holliday, Gen. List and R.F.C.

By his initiative and skilful manœuvring he led six hostile machines to an encounter with our own formation, during which five out of the six hostile machines were destroyed and driven down. He had been equally successful the day before in misleading hostile aircraft, and his originality and fearless example were of the greatest value to his squadron.

* * *

The King has been pleased to award a Bar to the Military Cross to the following Officer:—

Temp. Capt. Anthony Herbert William Wall, M.C., Midd'x R. and R.F.C.

By his initiative and skilful manœuvring he led six hostile machines to an encounter with our own formation, during which five out of the six hostile machines were destroyed and driven down. He had been equally successful the day before in misleading hostile aircraft, and his originality and fearless example were of the greatest value to his squadron. (M.C. gazetted July 18th, 1917.)

* * *

The King has been pleased to confer the Military Cross on the following Officers in recognition of their gallantry and devotion to duty in the Field:—

Sec. Lt. (Temp. Capt.) Brian Edmund Baker, Rif. Bde., and R.F.C.

He led his patrol with great skil against a hostile formation, which he attacked, accounting for five enemy machines out of six. Later, he drove a hostile machine down in flames, and attacked and destroyed another one by diving 7,000 ft. on to it and firing at such close range as to nearly collide with it. His gallantry has been at all times of great value to his squadron.

Sec. Lt. Leonard Monteagle Barlow, R.F.C., Spec. Res.

For conspicuous gallantry and devotion to duty when engaged in aerial combats. He has set a very fine example of courage and dash in attacking and destroying hostile machines. He also attacked and stopped a goods train, silenced a machine-gun on an enemy aerodrome, and dispersed troops on the roads from a very low altitude.

Lt. Geoffrey Sebasitan Buck, Lond R. and R.F.C.

He has taken part in many offensive patrols and has led 17, frequently attacking hostile troops on the ground. He has also successfully attacked and destroyed hostile aircraft on several occasions, setting a fine example of dash and determination.

Temp. Sec. Lt. Thomas Carlyon Luke, R.E. and R.F.C.

For conspicuous gallantry and devotion to duty in aerial combats. On several occasions he attacked hostile formations and dispersed them, although they were in superior numbers, showing great dash and fearlessness in engaging them at close range. He has taken part in 35 offensive patrols, at all times setting a fine example of courage and devotion to duty.

Capt. George de Chierri Pirie, Sco. Rif., Spec. Res. and R.F.C.

He has done exceptionally fine artillery work on two occasions whilst carrying out a shoot. He was attacked by hostile scouts in superior numbers, whom he dispersed, and then completed his work. On another occasion when by his means the artillery had knocked out three guns of a hostile battery, he descended to a low altitude and prevented the removal of the remaining gun, by dispersing the enemy with his machine-gun.

Sec. Lt. (Temp. Lt.) Lionel Mostyn Woodhouse, Yeo. and R.F.C.

His work whilst observing for artillery has been of the greatest value. During one month of observation he has been responsible for the destruction of 13 emplacements and for causing a large number of explosions and fires.

* * *

The King has been pleased to approve of the award of the Distinguished Conduct Medal to the following Man for acts of gallantry and devotion to duty in the Field:—

7420 1st Cl. Air Mech. C. M. Reynolds, R.F.C.

War Office, August 27th.

REGULAR FORCES.—The following N.C.O.'s and men to be Sec. Lts. for service in the Field :—

Memoranda.—For duty with R.F.C. :—1st Cl. Air Mech. E. A. Clear, from R.F.C., April 28th. Cpl. G. O. Lowe, from S.A., R.F.C.; 1st Cl. Air Mech. H. Spencer, from S.A., R.F.A.; 2nd Cl. Air Mech. C. W. G. Ratsey, from S.A., R.F.C.; 2nd Cl. Air Mech. A. K. Prentice, from S.A., R.F.C.; Cpl. C. J. Thomson, from S.A., R.F.C.

Establishments.—R.F.C.—Mil. Wing.—Wing Comdr. :—Capt. (temp. Maj.) D. L. Allen, R. Ir. Fus., from a Sqdn. Comdr., and to be temp. Lt.-Col. whilst so empld., July 1st.

Flt. Comdr.—Sec. Lt. (temp. Lt.) B. K. B. Barber, North'd Fus., from a Flying Officer, and to be temp. Capt. whilst so empld., August 10th.

Balloon Officer.—Sec. Lt. (temp. Capt.) B. H. Sisson, R.G.A., Spec. Res., to revert from a Balloon Comdr. (graded as a Flt. Comdr.), to relinquish his temp. rank and to be temp. Lt. whilst so empld., August 12th, 1917, with seniority from March 10th, 1916.

Equipment Officers, 1st Cl.—Qr.-Mr and Hon. Lt. (temp. Lt.) D. McBirney, R.F.C., from the 2nd Cl., and to be temp. Capt. whilst so empld., August 1st.

Gen. List.—To be temp. Sec. Lts. :—2nd Cl. Air Mech. S. Curzon, from R.F.C.; Sgt. F. R. Assinder, from R.F.C.

Memorandum.—Temp. Lt. J. S. Ruttle, attd. E. Kent R., to be Actg. Capt. (without the pay and allowances of that rank) whilst empld. as Adjt., R.F.C., Cadet Wing.

OVERSEA CONTINGENTS.—Canada.—Can. Army Dental Corps.—Temp. Capt. W. H. Gilroy is secd. for duty with the R.F.C., April 14th.

NAVAL.

The following appointments have been made in the Royal Naval Air Service :—

August 22nd.—Flt. Lt. (temp.).—R. R. Winder, promoted to Actg. Flt. Comdr. (temp.), seny. July 27th.

Flt. Sub-Lt. (temp.).—E. V. Reid, D.S.C., to be Actg. Flt. Lt. (temp.), seny. July 27th.

Lt. (R.N.V.R.).—N. C. Blanch, granted rank of Flt. Comdr. (temp.), seny. June 30th.

August 27th.—Flt. Sub-Lts., Proby. (Act. Lts., R.N.).—G. R. I. Snow and J. W. Havers, both promoted to Flt. Lts., seny. respectively May 4th and June 19th.

Flt. Lt. (Temp.).—W. M. Alexander to be Act. Flt. Comdr. (temp.), seny. August 3rd.

Flt. Sub-Lt. (Temp.).—D. F. FitzGibbon, to be Act. Flt. Lt. (temp.), seny. August 3rd.

Lts., R.N.V.R. (Temp.).—J. C. Savage and D. A. B. Noble, both to be Act. Lt.-Comdrs., R.N.V.R. (temp.), seny. respectively August 14th and 24th.

Temp. commissions (R.N.V.R.) have been granted to the following, sent as stated :—Lts. M. V. Conant, August 25th. W. Guidott, Sept. 2nd.

Admiralty Communiqués.

August 21st.—At about midnight, August 19th-20th, the Royal Naval Air Service dropped many tons of bombs on Middelkerke dump (south-west of Ostend) and on Brugeoise works.

All machines returned safely.

August 22nd.—A portion of our light forces, while operating off the coast of Jutland on the morning of August 21st, engaged and destroyed an enemy Zeppelin.

There were no survivors.

In amplification of Lord French's report issued earlier to-day, 10 enemy aeroplanes of the Gotha type were attacked by Naval aeroplanes in the vicinity of Ramsgate between 10 and 11 a.m. to-day.

The enemy machines, which were flying at a height of between 11,000 and 12,000 feet, were closely engaged, and in addition to the two mentioned by Lord French in his earlier communiqué, another was shot down by R.N.A.S. machines close to the coast. The remaining seven Gothas returned to seaward, followed by numerous Naval aircraft.

The pilot of an R.N.A.S. aeroplane, which chased the raiders oversea, reports that after firing 300 rounds of ammunition into one of the enemy machines, both gunners appeared to be killed. There was no fire in reply, even at 20 yards' distance.

As yet no report of the action taken by our aircraft at Dunkirk has been received.

11.50 p.m.—The following report has been received from Vice-Admiral, Dover, relative to the action taken by the Royal Naval Air Service at Dunkirk :—

Several flights of machines were sent out to intercept the enemy aircraft returning from England. One flight of three machines met 12 Gothas 35 miles north of Nieuport and engaged them, chasing them to Zeebrugge, but with no decisive result.

Another of our patrols of 10 machines engaged a flight of about 25 enemy escorting scouts who were off the coast awaiting the return of the enemy bombers, and in the ensuing fight five enemy aircraft were driven down completely out of control and probably some more, but in the close fighting accurate counting was impossible.

All our machines returned safely.

August 23rd.—A bombing raid by naval aircraft was carried out at 3 o'clock yesterday morning (August 22nd) on Zeebrugge Mole, shipping and batteries, some hits being made.

A raid was also made on Ghistelles aerodrome (about 10 miles south-east of Ostend) at 6.30 a.m., August 22nd. Bombs exploded near the western shed and a fire was started.

All machines returned safely.

August 24th.—Early yesterday morning (August 23rd) bombing attacks were carried out by the Royal Naval Air Service on the following military objectives :—

Middelkerke dump (about 10 miles south-west of Ostend).

Raversyde dump (north-east of Middelkerke).

Houttave aerodrome (about 10 miles north-west of Bruges).

Many tons of bombs were dropped.

All machines and pilots returned safely.

August 27th.—A bombing raid was carried out at midnight, August 25th-26th, by the Royal Naval Air Service on St. Denis Westrem aerodrome (south-west of Ghent), in which a large number of bombs were dropped.

One of our machines failed to return.

The Casualty List.

Reported August 22nd.

Missing.—Johnston, Flt. Comdr. P. A., R.N.
Bennetts, Flt. Sub-Lt. E. A., R.N.
Slightly Injured.—Sykes, Proby. Flt. Officer R., R.N.

Reported August 23rd.

Killed.—Glasgow, Flt. Sub-Lt. T. L., R.N.
Cook, Flt. Sub-Lt. C. B., R.N.
Missing.—Hodges, Flt. Sub-Lt. C. R. W., R.N.
Slightly Injured.—Keirstead, Flt. Sub-Lt. R. McN., R.N.
Drowned.—Moore, H. F., Actg. Air Mech., 1st Gde., J.28710.
Ward, H. R., Air Mech., 2nd Gde., F.6276.

Reported August 24th.

Killed.—Holroyd, Proby. Flt. Officer H. S., R.N.
Code, Proby. Flt. Officer L., R.N.
Missing.—Weir, Flt. Sub-Lt. C. H., R.N.
Injured.—Harrison, Sqdn. Comdr. J. I., R.N.
Brown, Flt. Sub-Lt. R. L., R.N.

Reported August 25th.

Killed.—Lewis, Flt. Sub-Lt. F. C., R.N.
Hutty, Obsr. Sub-Lt. A. I., R.N.
Wyatt, Flt. Lt. C. J., R.N.
Missing.—Lowther, Flt. Sub-Lt. C., R.N.
Injured.—Hobbs, Flt. Lt. B. D., D.S.O., D.S.C., R.N.
Slightly Injured.—Wimbush, Prob. Flt. Officer E. A. B., R.N.

Reported August 27th.

Killed.—Woodall, Flt. Sub-Lt. A. S., R.N.

PERSONAL NOTICES.

Deaths.

ARNOLD.—Flt. Lt. Charles Vernon Arnold, R.N., accidentally killed on August 16th, was born in 1894, and educated at Dulwich College and the South Kensington College of Engineering (City and Guilds), where he took his diploma and the B.Sc. degree (London), with first-class honours. At school he distinguished himself as a cricketer, and made in a first-class match the record of 173, and with his partner the record for the first wicket of 341.

On the outbreak of the war he volunteered as a private in the H.A.C., and transferred six months later to the R.N.A.S. He was on board the "Empress" when it was successful in saving over 400 lives from the torpedoed steamer "Hesperian." He afterwards served on the Eastern Mediterranean Station, and last spring was made commanding officer of an important aerodrome abroad. Later, he was appointed instructor at an aerodrome in the home counties. The accident which caused his death and that of his pupil, Probationary Flight Officer Forman, was due to engine trouble at a low altitude, resulting in side-slip. He was recognised as an able officer, zealous in work, firm and strong in discipline. Last spring both the British and French admirals signalled him from their ships, "Well done; your work was excellent! Our congratulations." He was the only son of Captain Ernest C. Arnold, R.A.M.C. (late of Forest Hill), and Mrs. Arnold (née Wedel), of Christiania.

One of those who served in the Eastern Mediterranean with him writes: "He was a wonderful observer's pilot for he always acted in the interests of the observer, and when banking he even put on just the right bank so as not to interfere with the wireless. If there were any dirty work to do he always got it and did it well.

"He was really a splendid fellow, and his work in the Eastern Mediterranean was wonderful, and it deserved the D.S.O. time and time again. On one occasion he undertook a rather deadly bombing raid in Asia Minor and on returning, although at rather a good height, some enterprising Turks opened fire on exactly

the same level with him, from a gun emplacement in the hills. He had a narrow escape, but returned to the ship with his floats riddled. Lord Torrington, R.N.V.R., now a prisoner, did some splendid work with Arnold.

"On leaving the ship from which he was then operating, he was put in command of an aerodrome, where he had the job of teaching Greeks to fly. He returned to England after about 18 months of strenuous active service. Aerial photography was Arnold's strong point, and whether flying Shorts or Schneiders he was a good all-round steady pilot, and he is a great loss to the Service."

BIBBY.—Flt. Sub-Lt. J. R. Bibby, R.N., who was killed in the Eastern Mediterranean on June 11th, was born in England and educated in Canada, where he was in charge of a power station at Niagara Falls. He took his pilot's certificate at the Wright Flying School, Florida. Upon appointment to the Royal Naval Air Service he completed his training at Windermere.

COOK.—Flt. Sub-Lt. Cecil Barnaby Cook, R.N., who was accidentally killed on August 20th, aged 18, was the younger son of Mr. and Mrs. Herbert Cook, of Bromley, Kent. He was educated at Dulwich College and obtained his commission in March and his certificate in July. He was an enthusiastic flier and his commanding officer stated that he was a most capable and promising pilot.

LEWIS.—Flt. Sub-Lt. Frank C. Lewis, R.N., who was killed in aerial combat on August 21st, was the only son of the late Frank B. Lewis, of Moscow Court, W., and of Mrs. Lewis, 18, Craven Hill Gardens, W. He was 19 years of age.

WYATT.—Flt. Lt. Charles J. Wyatt, R.N., who was killed on August 21st, was the second son of Mr. and Mrs. W. T. Wyatt, 87, Fordwych Road, Cricklewood, N.W.

Engagement.

JONES—ROBERTS.—The wedding arranged between Sqdn. Comdr. R. Hilton Jones, R.N., and Eileen, only daughter of Col. and Mrs. Astley Roberts, will take place at St. Saviour's Church, Eastbourne, on Wednesday, September 5th, at 2.30 p.m. No invitations are being issued, but all friends will be welcome at the church.

Marriage.

KEANE—MONTGOMERIE.—On August 21st, at Christ Church, Mayfair, Flt. Sub-Lt. E. J. Keane, R.N., was married to Evelyn Mary, eldest daughter of James C. Montgomerie, of 9, Walpole Gardens, Strawberry Hill, Middlesex, by the Rev. E. S. Hilliard.

Birth.

COURTNEY.—On August 24th, at a nursing home, Teignmouth, the wife of Wing Commander I. T. Courtney, R.N.A.S. (temp. Lieut.-Col. R.M.L.I.), of a son, who survived his birth only a few hours.

Vice-Admiral Bacon, presenting Distinguished Service Medals and Military Medals to over 50 members of the Dover Patrol, including the R.N.A.S., at Dover, congratulated the recipients, and said he looked to them to redouble their efforts to bring the war to a satisfactory conclusion. Some people said they were tired of the war. "We," he continued, "have not got to be tired of the war—we have got to help to fight the war, not to talk about it, especially at this time, when the Germans are having a bad time of it. Yes, a very bad time of it: and, what is more, they are going to have a worse one. For the last two years they have been afraid to tackle our Navy. During the next two months they will have again and again to meet our troops, and again and again they will be forced back, and they know it. Then, behind all, they have a hopeless winter of half starvation to look forward to. Now is the time to throw ourselves into any work that good fortune may bring our way. This particular patrol has its teeth well into their flanks, and forms a good stopper to the mouth of the Channel."

MILITARY.

G.H.Q. Communiqués.

August 21st, 9.2. p.m.—Great activity in the air continued yesterday on both sides. Our aeroplanes successfully carried out their usual work, although enemy aircraft were aggressive.

In air fighting nine German machines were brought down and seven driven down out of control.

Four of our aeroplanes are missing.

August 22nd, 9.12 p.m.—Yesterday there was again great activity in the air on both sides, and fierce fighting took place. Twelve German aeroplanes were brought down by our machines and five others were driven down out of control.

Twelve of our aeroplanes are missing, including two which collided behind the enemy's lines during a bombing raid.

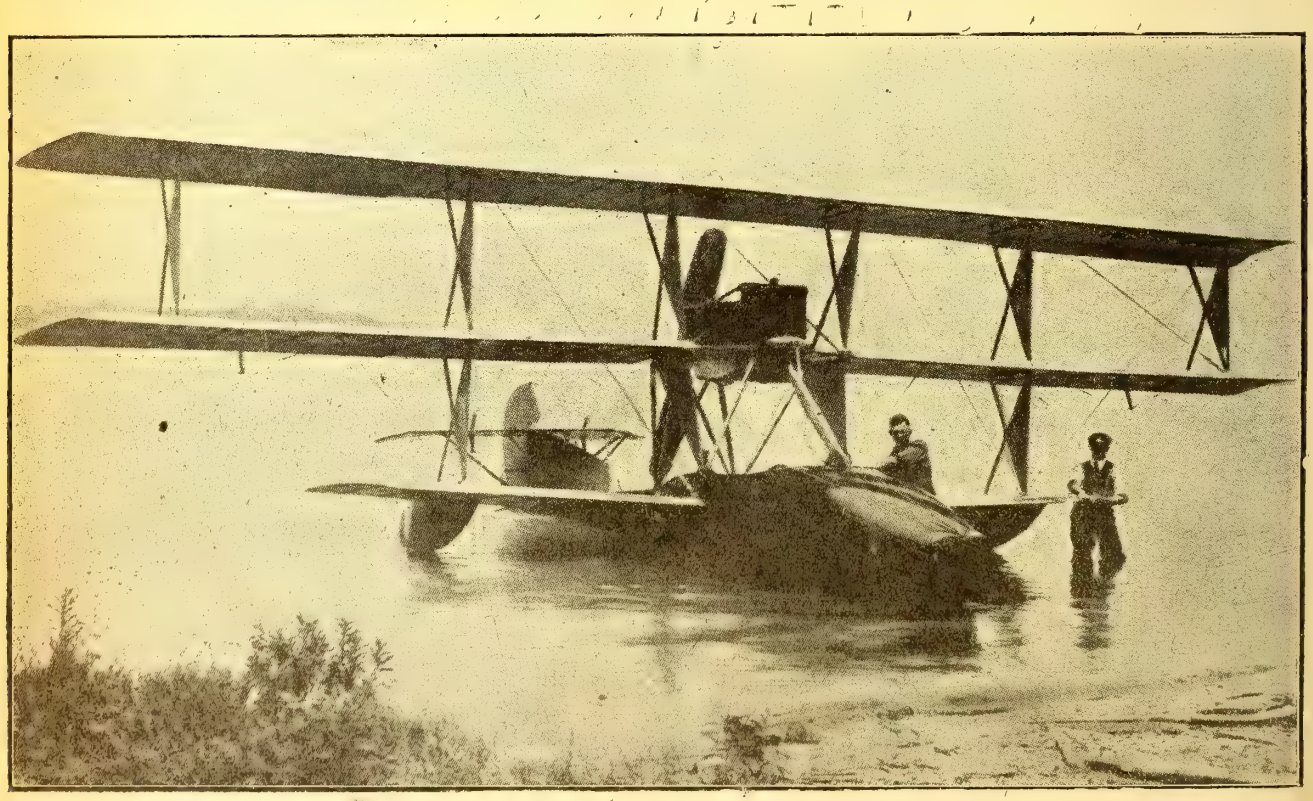
August 23rd, 9.10 p.m.—During the past week fighting in the air has been incessant and more severe than in any other similar period since the beginning of the war. Yesterday the activity of the enemy's aircraft was less marked, and his pilots appeared disinclined to engage when close to the lines. None the less a great number of fights again took place, in which our machines were favoured by the change of wind.

As the result of the fighting 12 German aeroplanes were brought down and six others were driven down out of control.

Two of our machines are missing, one of which was seen to effect a landing on the beach at Ostend.

Throughout yesterday's attacks our aeroplanes successfully co-operated with our artillery and infantry, and the usual bombing

(*Continued on page* 611.)



Reproduced from "Aerial Age Weekly," New York.

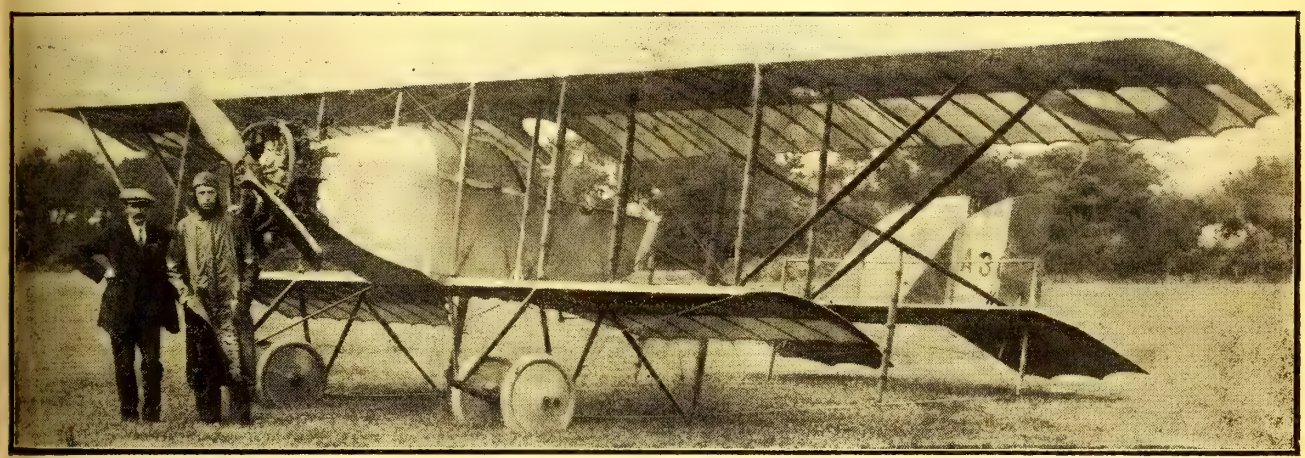
An Experimental Curtiss Hydro-triplane.

AERONAUTICAL ENGINEERING

SUPPLEMENT TO "THE AEROPLANE"

INCORPORATING AIRCRAFT ENGINEERING, AERODYNAMICS, AND MATTERS PERTAINING TO THE AERONAUTICAL ENGINEER AND THE AIRCRAFT TRADER

A Well-Equipped Flying School.



A Renault-Caudron converted for an Anzani engine. Mr. Etches and Mr. Brynildsen (the school pilot) are seen with the machine.

A recent visit to Bournemouth made it possible to inspect the new aerodrome purchased by the Bournemouth Aviation Co., Ltd., about a mile from the old temporary aerodrome at Talbot Village.

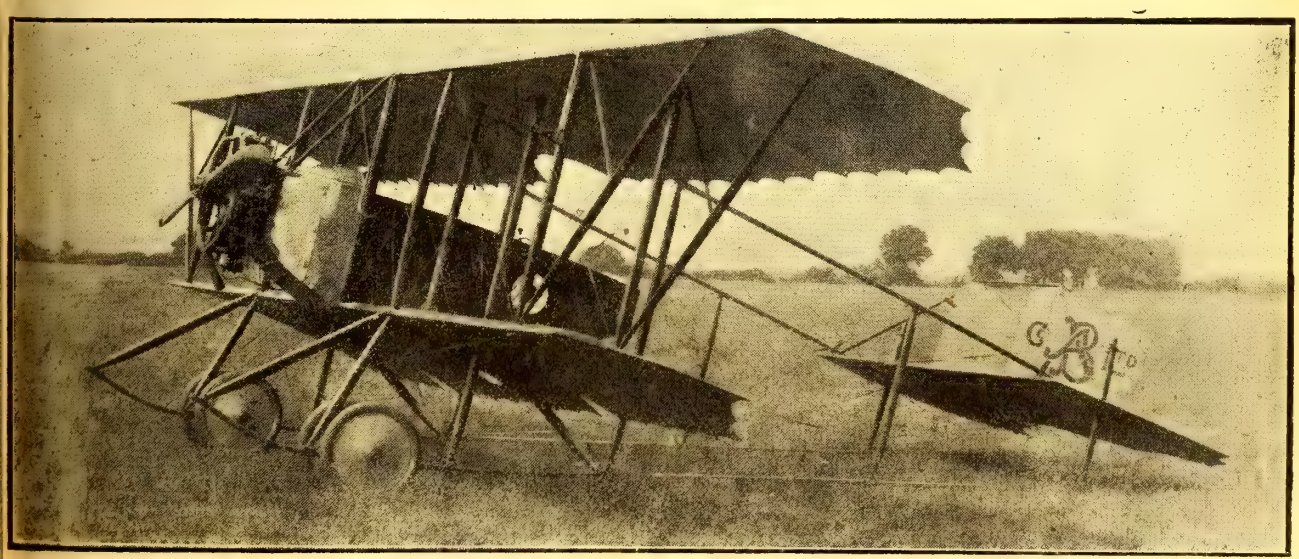
The new aerodrome is a fine tract of ground of about 100 acres in extent, surrounded on three sides by land which affords good landing ground in case of accident.

The feature of chief interest, however, is the large hangar in which the school outfit is accommodated.

One expects, in the well-equipped modern flying school, to see a decent array of machines, all tuned up and ready for work, but the additional spectacle of rows of fuselage and wing units, stacks of struts, tail planes and wheels is something rather new. Herein lies the explanation :—

From its inception, eighteen months ago, the proprietors of the Bournemouth School have always employed Caudron-type machines, some of which they constructed themselves. The selection has been justified because, from the start, the work of the school has been marred by no accident, something like a hundred pupils have received instruction, and during the school's existence only three forced landings have been made outside the aerodrome.

The first machine to be installed is still in daily use, although it has done over a thousand hours in the air, the repairs that have been done being of quite a minor character. Such an excellent record encouraged the firm to purchase from the Air Board 37 Caudron biplanes, most of them unused, which had been built to carry Renault engines.



A Caudron-type School Machine, built at Bournemouth and re designed internally.

A clever and effective nose-piece has been designed to take the 80-h.p. Anzani engine, of which the firm possesses a sufficient number, and, as has been mentioned before, this stock of machines is stacked around as a reserve, from which to draw in case of accident to any of the seven other Caudron type machines.

Mr. F. E. Etches, managing director of the school, has superintended the construction of the new premises, which are being equipped for the construction of complete machines, plant for wood and metal work, and acetylene welding being available.

Instruction is superintended by Mr. Brynildsen, a pilot of considerable ability, and he is very largely responsible for the record of success and safety which the school has enjoyed.

Mr. Etches has a special offer to make to candidates for the Flying Services and to those who have but a small amount of time in which to learn to fly. Full particulars of this scheme will be forwarded to inquirers mentioning The Aeroplane, and applications should be addressed to the Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth.—W. L. W.

The Italian Aircraft Industry and the War.

The following article is reprinted with acknowledgments from the "Aerial Age Weekly," New York, dated July 30th :—

[The Aeroplane takes no responsibility for the accuracy or otherwise of any statements following.]

Italy's experiences in military aeronautics, which she entered, practically a newcomer, in 1915, and which have enabled her now to produce the most powerful aeroplane in the world, a craft driven by motors totalling 900 horse-power, and capable of sustaining three tons besides the craft's own displacement and the weight of its operator and fuel, are an indication of the possibilities which the recently energised activities of this country may accomplish. For, according to Major R. Perfetti, of the Italian Royal Flying Corps, nearly all of Italy's aircraft, at the front and now under construction, have been manufactured of raw materials supplied by this country, the same type and quality of materials which are now at the disposal of the United States Aircraft Production Board, and the industry that has developed these materials into finished products of the highest type is itself the development of manufacture that in February, 1915, employed only 100 men. Now 40,000 are engaged in aeroplane manufacture in Italy.

In an address delivered last week at the Automobile Club under the auspices of the Aero Club, Major Perfetti extended the thanks of Italy to the United States for the assistance of this country in advancement of Italian aeronautics, and, after an explanation of the efforts of Italian aeronauts to develop motors of especially high power, made a plea that the United States devote itself to the creation of very large engines.

"Italy has made tremendous progress in the technique of aeroplane construction," said Major Perfetti. "She has created a range of types which represent the fastest aeroplane in the world, with a speed of 139 miles an hour, and the fastest seaplane, with a speed of 112 miles an hour, and the largest aeroplane, the Caproni triplane, with a 900 horse-power motor and capable of carrying three tons. But we and the United States must make still more progress.

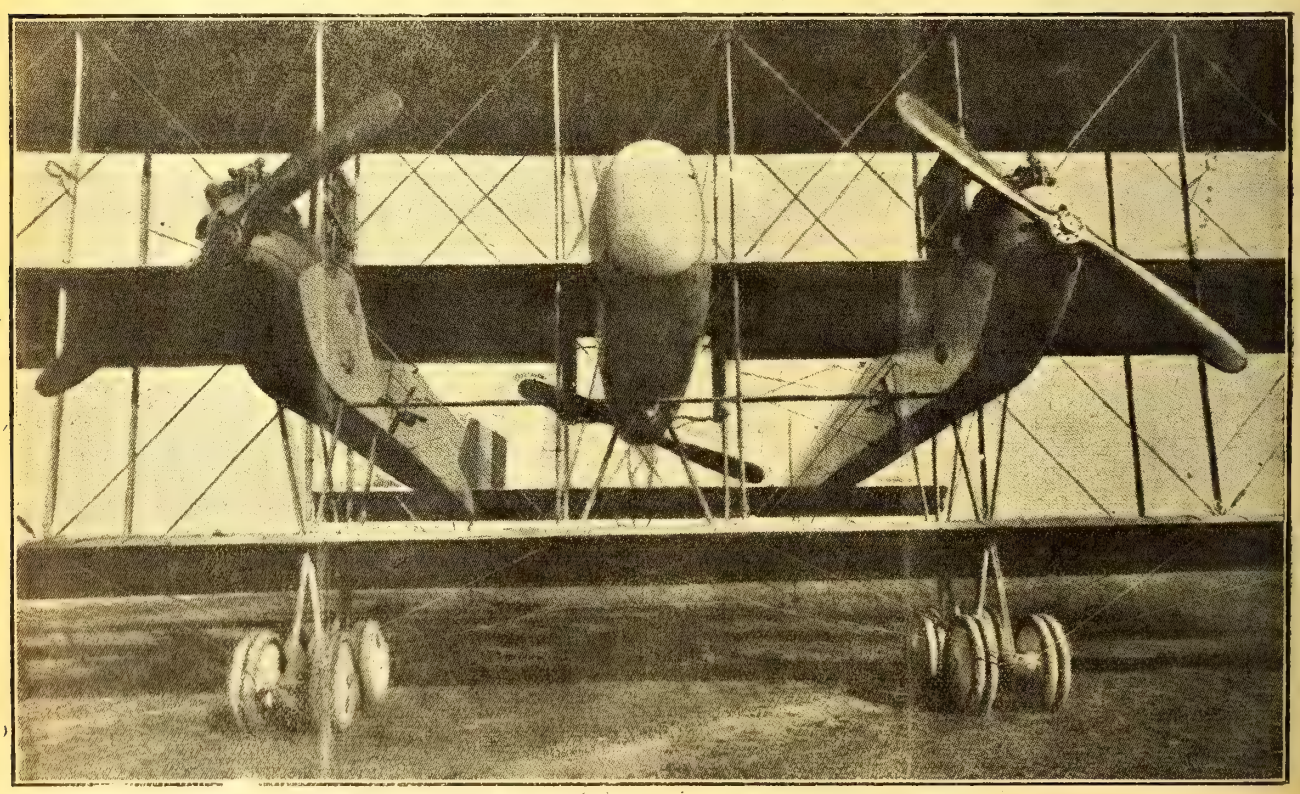
"Since the beginning of the war in 1914 we have seen the land armies attain a sort of balance which would be difficult to upset without great sacrifice of life. But it must be upset or some other solution must be found, for the extensive success of the submarine is threatening the supply of materials essential, not only to sustain life, but to conduct the war. We must find a method which will drive the enemy back, not a mile or two, but for tens and hundreds of miles. To accomplish this the important supply bases of the enemy must be destroyed or rendered temporarily useless, and the aeroplane seems to offer the only immediate solution.

"Until now the chief factor in military operations has been the gun designed to discharge large quantities of high explosives. The aeroplane has been used chiefly for scouting. Now the aeroplane must be used as an instrument for carrying and discharging explosives beyond the range of land batteries and the supply of explosives each plane carries must be large.

"The possibility of accomplishing this is apparent when one studies the history of the aeroplane in war. The first planes were equipped with motors of 100 horse-power and under, and they had a comparatively short cruising radius because of inability to carry both fuel and explosives; one or the other had to be sacrificed.

"To-day we have reached a point where the 1,000 horse-power motor may be turned out capable of carrying three tons and more of useful weight and with a cruising radius of 300 to 350 miles, and it is along these lines that Italy has been conducting experiments. The big Caproni triplanes are already in use by our Government for transportation of men and supplies between military centres, and their carrying range, both in weight and distance, will be increased as development proceeds.

"Besides this, Italy has manufactured a large number of the famous semi-rigid Forlanini dirigibles, which are more efficient than the Zeppelins, half the weight of the Zeppelin, the aluminium frame having been eliminated in the Italian construction. For two years the Forlanini has convoyed ships nightly from Italian ports, keeping a watch for U-boats, and not a ship so convoyed has been sunk."



Reproduced from "Aerial Age," New York.

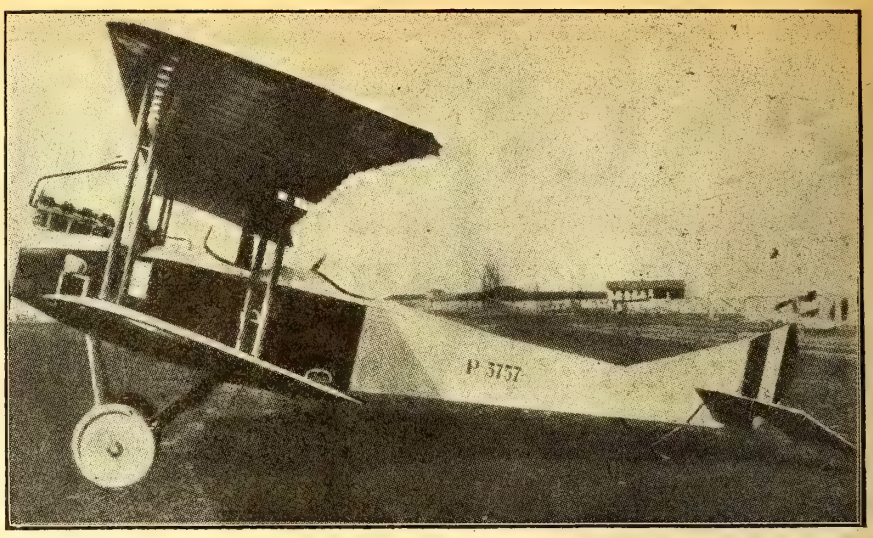
The Fore Part of a Caproni Triplane.

But, successful as this nation has been, Major Perfetti asserted that the combined aerial resources of the Allies were inadequate to the programme which he proposed, and he urged the United States, as the most valuable immediate step it could take, to begin the construction of vast numbers of aeroplanes and the development especially of great motors.

With A. Pomilio, an electrical engineer, Major Perfetti has been in this country for two years studying American aeronautics for his Government and contracting for the supply of aeroplane spruce, motor parts and so forth, which have made the Italian construction possible.

Some of the machines which Major Perfetti spoke of were astonishingly large. The 1,800 horse-power Caproni, carrying a load of five tons of explosives and fuel for twelve hours, has a speed of 80 miles per hour. The 600 horse-power Caproni triplane has two fuselages, with three Fiat or Isotta-Fraschini motors. Each of the engines is independent of the others, so that if two engines should stop, the machine could still keep in the air with the power of one engine. The machine carries a useful load of 4,400 lbs., which permits carrying fuel for six hours, a crew of three people, three guns, and 2,750 lbs. of bombs. It has a speed of close to 80 miles an hour, and is capable of climbing 3,250 ft. in 13 minutes, 6,500 ft. in 27 minutes and 10,000 ft. in 57 minutes.

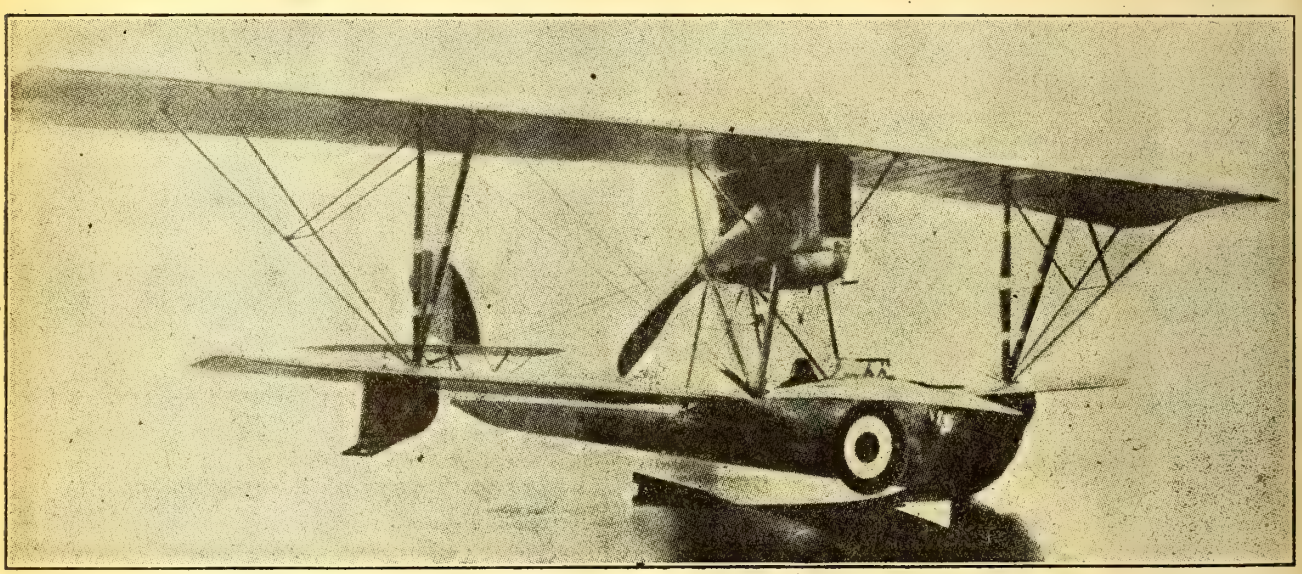
The 600 horse-power bombing-type Caproni biplane, illustrated herewith, has the remarkable speed of 92 miles per hour. It is equipped with three Fiat motors of 200 horse-power. It can climb 3,250 ft. in six minutes and 30 seconds, 6,500 ft. in 14 minutes and 10,000 ft. in 35 minutes.



The Pomilio High Speed Two-Seater.

The 200 horse-power S. I. A. armed reconnaissance biplane is a two-seated machine with a speed of 118 miles per hour and a climbing speed of 3,250 ft. in 3 minutes.

Besides the above Italy has developed several other efficient types of seaplanes and fighting aeroplanes, including the Macchi seaplane, with a speed of over 110 miles an hour; the Pomilio gun-carrying biplane, with a speed of 108 miles an hour, and the S. V. single-seater fighting tractor, which is reported to give a speed of close to 140 miles an hour and a climbing ability of 10,000 ft. in 8 minutes.



The Nieuport-Macchi Flying Boat.

PRACTICAL PYROMETERS.

The Foster Instrument Company, of Letchworth, Herts, has issued a new catalogue of pyrometers, No. 19.

The catalogue draws attention to the use of Hoskins' patent construction and alloys in the Forster thermo-couples, which possess high electro-motive force and great robustness. These qualities are also found in the indicating and recording instruments used with the thermo-couples.

Pyrometers are listed for all purposes, for low and high ranges of temperature.

The Foster Company has made arrangements to maintain pyrometer sets by contract upon terms which are advantageous to users.

The catalogue contains diagrams showing the methods of installing the different pyrometers in furnaces and other heating chambers. Those interested are invited to apply for copies of this interesting catalogue.

NEW PREMISES

Thompson Bros. (Bilston), Ltd., of the Bradley Engineering Works, Bilston, have taken possession of large new buildings opposite their present works in order to find more adequate room for the manufacture of metal components for aircraft, on which they have been engaged for the last two years.

The new shop is 130 ft. long, 50 ft. wide, in one span, being well lighted and ventilated. It is equipped with electric drives for the machines, comprising modern lathes, capstans, millers, saws, grinders, drills, power presses, etc. It is also provided with a large oxy-acetylene welding plant, and there is also a small woodworking and doping section.

It is not possible to give details of the work carried out, but it consists chiefly of under-carriages, tubular framework, engine plates, levers, etc., and the welding of aluminium and steel, etc.

Extensions in the shape of stove enamelling and dope shops are also being laid down. All inquiries will receive prompt attention.

The Production of Aeroplanes and their Components

(Eleventh Instalment.)

BY STEPNEY BLAKENEY.

Making Eyebolts.

Eyebolts are made in precisely the same way, only that round steel bar is used instead of hexagon, and the parting-off tool is shaped so as to produce a semi-circular elongated end. The bolt is then put into a milling jig or clamp and the head milled between two milling-cutters. This can be done with batches of, say, about eight at a time, after which each batch is put into a drilling jig and drilled.

Should the eyebolt require to have the eye at a certain angle, then of course the jig which holds the eyebolt during the milling process is made to hold the bolt at the required angle, and thus accuracy is obtained. The accuracy of this angle is most essential, otherwise a fair pull is not obtained by any tie rod or streamline wire which may be attached to it, and inaccuracy may start a dangerous fracture.

To the inexperienced erector this item may not appear to be of much importance, but it happens to be one of those matters which strictly demand the attention of all erectors. It applies to wiring plates as well, which must be bent to suit the angle precisely, between the two points of attachment of any tie rod or streamline wire.

Snugs.

Reverting again to eyebolts, many of these are made with a "snug" under the head. This, to those who are not familiar with this term, consists of a projection to prevent the bolt from turning round when in its correct position. This operation in the manufacture of eyebolts is usually done by using a dividing head attached to a milling machine table. This holds the bolt in position whilst the milling cutter produces the required shape, which in many cases may be described as a semi-elliptical projection, about 3/16-in. deep.

Lift Plates.

Lift plates, i.e. those which take the main load or flying wires of the machine, frequently consist of laminated plates soldered together. These have to be made with considerable care, as much experience is necessary in knowing the additional amount of length required to allow for bending, so as to enable the various holes to be drilled accurately in position.

To enable this to be done, it is necessary to pin the laminations together and put the fitting in a jig to be drilled, after which it is best to use a cast iron or mild steel block, designed to be used as a bending jig. It will be almost impossible to describe these, as of course they are very numerous owing to the number and various types of fittings to be bent. Accordingly it is best to get the tool-maker to design one specially to suit the particular fittings required to be bent.

The value of a small fly press is considerable for many small parts, and, with simply designed jigs, an intelligent youth can produce a considerable number per day of small washers, etc.

Chassis Strut Fittings.

The chassis strut fittings will now be required, and these will require careful thought, as they are made to grip the lower front spar, and at the same time pass round the compression strut. The first thing to do in making fittings of this description is carefully to set out the whole fitting on some light gauge block-iron and steel, and bend up the fitting and tack it in shape by welding it together.

After this the portion for holding the chassis struts can be set out on the flat plate and bent up to the required streamline shape. Then the angle required by the strut can be checked.

This having been done, the fitting and manufacture of this part must be commenced. For this purpose, and to assist the sheet-metal worker or fitter employed, it would be as well to have a dummy portion of the front spar fitted onto a dummy compression spar, so as to enable the metal-worker to grasp what to do.

Also a couple of rejected struts (which, of course, should not exist) may be cut to dead size in the wood-finishing department, and handed over to the metal department, so that they can be actually placed into the position and fittings made for them, and thus it will enable the worker accurately to discover the dimensions to which he has to work. It will also ensure the streamline portion of the fitting which holds the strut being accurately fitted to the portion clipping the front spar and the compression strut.

This accurate fitting is most necessary, otherwise the joint between the two fittings will be a very bad one, and this might lead to disaster at any moment if the machine landed on rough ground. This might occur for any of the following reasons: either the acetylene-welded joint between the two component parts forming the fitting might be weak, and badly fitted to enable the right-angle of splay to be obtained, in which case there would be gaps to be filled up with the welding; or else the strut may never have been normally and naturally at the right angle, and may have been strained or forced into. This procedure would either badly strain the fitting or the strut, and possibly both, and the ultimate result would be a bad failure, possibly at some critical moment.

Therefore it can easily be seen that the fitting and making of such fittings as I have briefly described requires patience and care, and the first one or two will in all probability take double the time to make that the last ones take. But that cannot be helped; accuracy and perfect workmanship must be had.

The above remarks equally apply to the fitting to be made for attaching and holding together the two struts in the Vee shape in accordance with the design, and also for holding the steel tube forming the axle and the shock-absorber fittings.

The steel tube which forms the axle is usually of air-hardened steel, and the drilling of the holes in it, for attaching the "rubbing plates," or distance washers, against which the chassis wheels rub, and by which they are kept in position, entails considerable trouble owing to the hardness of the steel. I have found by experience that frequently a shop-made flat diamond-pointed drill is superior to any twist drill for drilling the holes for the taper pin. Turpentine forms the best cutting compound, or lubricant.

The wheel is kept on the axle by means of a large washer, about 3/16-in. thick by about 1¼-in. long, which is an easy push-fit over the axle, secured into its place by another taper pin.

These washers are, of course, turned out of solid bar or turret lathes, and are of the usual class of bar work for which turret lathes and capstan lathes are made. The washers are usually made by girls doing repetition work in the machine-shop.

Strut Sockets.

The strut sockets for the centre plane will be the next fittings to consider. These will take the form of sheet steel streamlined sockets on wiring plates, attached to the top longerons into which the struts will be bedded. The bracing wires will be attached to the lugs for bracing the centre plane.

These sockets will probably be made of 18 gauge sheet steel, welded to the wiring plate, which will be made of about 12 gauge steel. As these fittings occupy a position of considerable importance, like other parts they must be made accurately to the dimensions given. Care must be taken that the process of welding in no way impairs the strength of the fitting.

Considerable care must be taken to see that the wiring lugs are fully up to size, and also that all radii on the wiring lugs are fully up to dimensions. It is important also that the pin-hole in the lugs is correctly in position and that the hole after drilling is accurately finished to dead size with a reamer. These points must be carefully looked to, or you may be sure that they will be detected by the A.I.D. inspector.

The result will be that he will lose his confidence in you, and he will consequently be liable to treat every fitting put up to him for his inspection with considerable suspicion. This is the most undesirable thing that could possibly happen. If possible, try and convince the A.I.D. by actual practice that he cannot teach you anything, but don't imagine it; that is fatal; see to it yourself, and don't pass the job on to somebody else to do. He may think that if you are too tired to do it, that it is of not much importance, and then the trouble commences.

If everybody did their job, I think that most firms would find that there would be considerably less work for everybody to do. Shorter hours would be possible, and greater output would follow.

Spar Brackets.

The spar brackets for attaching the lower wings to the fuselage consist, for our purpose, of mild steel stampings. These, of course, must be machined all over, and the lugs, where the hinge pins pass through, carefully machined to a specified angle with the rest of the bracket so as to give the wings the required angle of incidence.

The best way to machine these is to clamp them to a machining jig onto the bed of the table of a milling machine, about four at a time, and pass a couple of side to face milling cutters past the jaws of the stamping, and then mill out the centre portion with a single cutter. When this work is complete, they can be transferred to another jig and milling machine and have the outside surfaces of the jaws milled.

This being done, the next thing to do is to mill the lug to the required angle, between milling cutters, and then fix the bracket for drilling the hinge pin-hole; the lightenings can then be drilled out and finished with a round file. The only remaining work to be done is the drilling.

(To be continued.)

AMERICAN TIMBER SUPPLIES.

From "Aerial Age," New York, August 6th :—

As a result of a conference held for the past three days between authorised representatives of spruce manufacturers of Oregon and Washington and representatives of the Signal Corps, the Aircraft Production Board, the British, French, and Italian missions now in Washington, and the lumber committee of the National Council of Defence, Howard E. Jayne and F. A. Douty, of Oregon, proposed on behalf of the spruce men to furnish aircraft spruce for the coming year's big programme at 105 dols. per 1,000 ft. This price is about one-half that which has been paid up to now by many of the aeroplane manufacturers. The price applies to the Allies' needs as well as to those of the United States.

If it is finally approved by Government authorities it will, in the opinion of the lumber committee, unquestionably result in a big saving on spruce requirements.

The specifications which have been proposed by the spruce men and which received the informal approval of the Government's representatives present are as follows :—

THICKNESS.—2 ins. to 6 ins., inclusive. At least 60 per cent. to be 3 ins. and 4 ins. thick. Not more than 40 per cent. 2 ins., 5 ins., and 6 ins. thick.

WIDTH.—All to be 4 ins. and wider; not over 10 per cent. under 5 ins. wide.

LENGTH.—Fifty per cent. to be 19 ft. and longer. Fifty per cent. to be 4 ft. and longer.

MEASUREMENT.—Width and thickness fractional. Lengths in multiples of 1 ft.

GRAIN.—All lumber 3 ins. and thicker shall be not less than 70 per cent. vertical grain of an angle of 45 degs. to 90 degs. on each carload. All lumber 2 ins. thick shall be not less than 30 per cent. vertical grain of an angle of 45 degs. to 90 degs. on each carload.

GRADES.—The grades agreed to are as follows :

The 50 per cent. of all lumber 18 ft. and longer shall be clear four sides, straight grained, not less than six annular growth rings for each 1 in., sound and well manufactured, free from shakes, spiral and curly grain.

This grade will admit of bright sap, wane, pinworm holes, slight variations in sawing, or other defects that will not impair its use for wing beams.

The 50 per cent. of all lumber 4 ft. and longer shall yield clear cuttings, straight grained, not less than six annular growth rings per each 1 in., sound and well manufactured, free from shake, spiral and curly grain; some may contain knots, pitch pockets, wane, pinworm holes, slight variations in sawing, and other defects that will not impair its use for the purpose intended, providing, however, that each piece must produce, for buyer, clear straight grain, cuttings from 4-ft. to 17-ft. lengths, which shall not include over 5 per cent. of such cuttings, 4 ft. to 7 ft. inclusive.

AMERICAN TRADE NOTES.

The Curtiss Aeroplane and Motor Co., of Buffalo, is erecting plant at Atlantic City, N.J., which is expected to be in running order in about a month's time. The construction of aeroplanes will be undertaken. In addition a school for candidates for admission to the U.S. Flying Corps will be organised.

* * *

The Curtiss Aeroplane and Motor Corporation have issued the first edition of a monthly magazine dealing principally with Curtiss affairs and with aviation in general.

The "Curtiss Flyleaf," as this production is called, records the appointment of Mr. Glenn H. Curtiss to the Presidency of the Aircraft Manufacturers Association, and also bears witness to the work of Mr. Curtiss in the past and to the achievements of the Curtiss aeroplane.

The "Flyleaf" is well illustrated with half-tone and line blocks, and taking it all round is a very successful effort.

MACHINE TOOLS.

A souvenir catalogue, in the composition of which considerable brain-work has been expended with excellent results, has come to hand from The Judson-Jackson Co., Ltd., which gives much interesting information about this well-known firm. The illustrations show many interesting machine tools, including Capstan lathes, screw-cutting lathes, and appliances of a kindred nature. An interesting feature of the catalogue is a short paragraph facing each illustration, giving sound advice upon very varying aspects of manufacturing business with relation to such subjects as the comfort of workers, foreign and colonial policy, questions of output and of equipment generally.

Messrs. Judson and Jackson are evidently very much alive to the importance of detail, which contributes so largely to successful manufacture. This firm also produces boring, slotting and drilling machines of all descriptions, power hammers and small articles such as hacksaw blades and drills. Machine-shop superintendents would therefore do well to bear the name of the firm in mind, and to send any inquiries to 50, Marsham Street, London, S.W.1.

A NEW DEPARTURE.

The firm of John Meerloo and Sons, of Cleveland Street, Mile End, who are already well known in the Aircraft Industry for the manufacture, inspection, and other steel stamps and stencils, have formed a new company, called the Meerloo Engineering Co., Ltd., for the purpose of manufacturing all kinds of aircraft parts, especially small repetition parts and pressings.

A modern factory has been acquired opposite Maryland Point Station, G.E.R., Stratford, and has been thoroughly equipped with up-to-date machine tools.

The firm is already producing A.G.S. parts in large quantities, and holds important contracts for their manufacture.

It is the intention of the proprietors to develop the business and to increase output by the addition of further plant, and a day and night shift will be worked.

Mr. Jack Meerloo is the managing director of the new concern, and his great experience of metal work, which extends over a period of thirty years, should be invaluable in the efficient production of aircraft parts.

The firm are open to consider further contracts, and invite inquiries.

POWER PLANT.

In the nature of things, the organiser of a new works has frequently to establish himself miles and miles from civilisation, and in many instances is forced to make his works self-supporting to as great a degree as a colonist. He is obliged not only to provide his own quarters and draining systems, but also lighting and power.

When this emergency arises it should be borne in mind that Messrs. Ruston and Proctor, of Lincoln, produce many tpyes of heavy oil engines which are suitable for supplying power direct, or for generating electricity for motors and lighting purposes. A well-equipped aircraft works in the South of England employs an oil engine made by this firm with considerable success, and by the aid of dynamos and storage batteries is independent of all outside aid in its supply of power and light.

LE MOT JUSTE.

From the "Daily Express."

The development of the war in the air is responsible for many romances. Not the least interesting among them is the story of Mr. John A. Whitehead, the founder of Whitehead Aircraft, Ltd. He is an Englishman who, when little more than a boy, ran away from home to make a fortune in the States. The fortune did not materialise, but he gained what was more valuable, much worldly and practical experience. He returned home a year or so before the war, filled with the American spirit of enterprise.

He had little money, but, as an American friend puts it, he had "inexhaustible credit in the Amalgamated Bank of Imagination and Nerve." This stood him in good stead, and he was among the first to see that aircraft would be a dominating feature in the war.

To-day he controls an aircraft company with a large capital, has 2,000 employees, an aerodrome of 300 acres at Hanworth Park "up the river," and lives with his mother in Buccleuch House, once the Duke of Buccleuch's magnificent home, just above Richmond Bridge.

WANTED—A CANE.

"Lost, 5.55 train, Eastbourne-Clapham Junction, Sunday afternoon, August 19th, Malacca Cane with golden aeroplane worked round upper portion, aviator's cap on end of curved handle. Considerable sentimental interest attaches to the stick, presented by certain famous airman to owner, with name inscribed. Reward from J. A. Whitehead, Whitehead Aircraft, Richmond."

THE SOPWITH SPORTS MEETING.

The Sopwith Aviation Company's annual sports and fête will take place on Saturday, September 15th, at the Old Kingstonians' Football Ground, Kingston, commencing at 2 p.m.

The competitions, which will include five events, open to all munition workers, will be governed by the A.A.A. Laws; and as the proceeds will be devoted to the Flying Services' Fund, it is hoped that a very large entry will be received.

The open events are as follows: 100 yards handicap, 440 yards handicap, one mile handicap, one mile relay race, and tug-of-war (teams of eight). Entrance fees: handicap events, 1s. each; relay, 3s. per team; tug-of-war, 8s. per team.

There is also a special invitation race, open to members of the R.N.A.S. and R.F.C. only, 100 yards handicap.

There will also be works championships, novelty races, and other competitions.

The sports will be followed by a grand dance at 7 p.m., and a concert by the Sopwith Choral Society. The Sopwith Orchestra will provide music.

Entries close first post on Tuesday, September 4th, and full particulars may be obtained from the hon. sports secretary and director, Mr. V. W. Derrington, the Sopwith Aviation Co., Ltd., Kingston-on-Thames.

Munition workers of all sorts are cordially invited, both as spectators and as competitors. Admission to the grounds will be 6d. and 1s. Refreshments at popular prices.

The Aeroplane

Acetylene Welding Plant—

Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—

Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation, Newcastle-on-Tyne."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2 City 7724.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.

Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."

Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."

Martinsyde, Ltd., Brooklands, Byfleet. Woking 331; Byfleet 171. "Martinsyde, Weybridge."

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455 "Nieuscout, Crickle, London."

Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."

The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. Putney 2240-2241, "Carbodis, London."

Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerfyta, Knights, London."

Waring & Gillow, Ltd., Hammersmith. Museum 5000. "Warisen, Ox, London."

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

White, J. Samuel, & Co., Ltd. East Cowes. Cowes 3. "White, East Cowes."

Airships—

Airships, Ltd., High Street, Merton. Wimbledon 1314.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, 'Phone, London."

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Bizfibild, London."

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.

The Wilfley Co., Ltd., Salisbury House, London Wall, E.C.2 City 2681-2. "Wrathless, Phone, London."

Cable Coverings and Cable Controls—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Capstan Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Castings (Aluminium, Brass, Bronze, Machined or Rough)—

Coan, R. W., 219, Goswell Road, London, E.C.1 City 3846. "Krankases, Isling, London."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."

London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."

Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—

Accles & Pollock, Ltd. Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."

B. D. V. Aircraft Spares, Syon Chambers, 16a, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aerocracons, Canning, London."

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—

British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."

British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3022. "Ajawb, London."

Clark Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic. London."

Elastic Cords—

Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—

Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. Midland 981. "Fahrenheit, Birmingham."

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—

E. Kalker & Co., Coventry. Coventry 241 "Kalker, Coventry."

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford No 1. "Pump, Bedford."

Arrol-Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."

The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000

Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. Gerrard 238. "Beardmore, London."

Dudbridge Iron Works, Ltd. (Salmson), 87 Victoria Street, London, S.W.1. Vic. 7026 "Aeroflight, Vic., London."

Gordon Watney & Co., Ltd., Weybridge Weybridge 550 (7 lines). "Mercédès, Weybridge."

Green Engine Co., Ltd., Twickenham Richmond 1293.

Gwynnes, Ltd., Hammersmith Iron Works Hammersmith, W. Hammersmith 1910 "Gwynne, Hammersmith."

The Selsdon Aero & Engineering Co., Ltd. Imperial House, Kingsway, W.C.2. Regent 1181

Sturtevant, B. F., Co., Ltd., Hyde Park, Boston U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Moorfield Wolverhampton."

The Gnôme & Le Rhône Engine Co., Ltd. 47, Victoria Street, S.W.. Walthamstow 408 (2 lines). "Elevenfold, London."

Willans & Robinson, Ltd., Victoria Works Rugby. Rugby 112 (3 lines). "Willans Rugby."

Flexible Shafts—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Flying Schools—

Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. Bournemouth 1160 "Etches, Winton."

Cambridge School of Flying & Aerodrome Co. Ltd., 30b, St. Andrews Street, Cambridge

Galvanising—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich.

Cowper-Coles Manufacturing Co., Sunbury on-Thames. Sunbury 37

Gears—

Moss Gear Co., Ltd., Thomas Street, Aston Birmingham. East 407. "Mosgear, Birmingham."

Glue—

Improved Liquid Glues Co., Ltd., Gt. Hermitage Street, E. (Croid.). Avenue 3178 "Excroiden, Wapp, London."

Mendine Co., 8, Arthur Street, E.C. Bank 5873

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340 "Shatterlys, Piccy, London."

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines) "Comyn, Ching, Westcent, London."

Chas. P. Kinnell & Co., Ltd., 65 & 65a Southwark Street, London, S.E.1. Hop 372 (2 lines). "Kinnell, London."

Instruments—

British Wright Co., Ltd., 33, Chancery Lane, W.C.2 Holborn 1308

Instruments (Scientific, Altimeters, Speed and Pressure Gauges, etc.)—

Short & Mason, Ltd., Macdonald Road, Walthamstow, E.17. Walthamstow 180. "Aneroid," Phone, London

Machine Tools—

Brewster & Co., 11, Queen Victoria Street, E.C.4. City 768. "Circumfuse, Cannon, London."

Magneto Driving Pieces—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Magnetos—

The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. 1008-1009 Coventry. "Corlton, Coventry."

The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. Museum 430. "Vicksmag, Phone, London."

Metal Manufacturers—

Chas. Clifford & Sons, Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

Metals in General—

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

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Metal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."
Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."
Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2297.
Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041. "Bayliss, Wolverhampton."
The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow, London. Hounslow 254. "Golshel, Hounslow."
Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. Museum 70. "Installing, Eusroad, London."
Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261. "Fremo, Birmingham."
Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."
Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

Metal Shearing Tools—

Montgomery, Smith & Co., Ltd., Tangent Works, Keynsham, near Bristol. Keynsham 21. "Ingenuity, Salford."

Metal Spinnings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Metric Bolts—

Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

Miscellaneous—

Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."
Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C. Central 3731.
Bowdon Wire, Ltd., Willesden Junction. Willesden 2400 (3 lines). "Bowirelim, Harles, London."
Brown Bros., Ltd., Great Eastern Street, E.C.1. London Wall 6300. "Imbrowned, Bethroad, London."
Edison Swan Electric Co., Ponder's End. (Lamps). Enfield 520 (6 lines). "Ediswan, Enfield."
Herbert Frood Co., Ltd., Chapel-en-le-Frith. Central 793. "Frodobrake, Birmingham."
Glasso Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.
London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—

Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
Standard Motor Car Co., Coventry. Coventry 530 (4 lines). "Flywheel, Coventry."

Observation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Packers, Shippers, Etc.—

Lep Transport & Depository, Ltd., Castle Street, Long Acre, W.C Regent 5464. "Depolep, London."

Patent Agents—

King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.
Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.
Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Petrol Storage (Bulk)—

Bywater & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. Gerrard 2220. "Bywaterist, London."

Piston Rings—

British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—

Bliss, E. W., Co., 2a, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissdon, London."

Presswork—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."
Integral Propeller Co., Ltd., Hendon 9. Kingsbury 104. "Aviprop, Hyde, London."
Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."
Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Stanley Aviation Co, 67, Kingsland Road, E.2. City 8347.
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil"

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—

C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. Chapeltown 474. "Instrument, Leeds."

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The Norman Thompson Flight Co., Ltd., Middleton, Bognor Bognor 48. "Soaring, Bognor."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Short Bros., Rochester. Chatham 627. "Seaplanes, Rochester."
Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Shackles—

The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. Hounslow 254. "Golshel, Hounslow."

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.
Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sheet Metal Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Shock Absorbers (Elastic Cord)—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—

Forward Motor Co., Summer Row, Birmingham. Central 6259.
Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.
Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."
Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—

Dart Spring Co., West Bromwich. West Bromwich 322. "Dart, West Bromwich."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—

Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."
Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield"

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—

Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—

John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.
James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London"
R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."
The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Weskent."

Varnishes—

Clark R. Ingham, & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."
Harland, W., & Son, Merton. Wimbledon 45.
Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."
Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Washers—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Watchmakers and Jewellers (Silver Models)—

Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—

Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."
London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—

Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wiremill, Musselburgh."
Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Wirework—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Woodworking Machinery—

Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."
Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."
Wadkin & Co., Leicester. Leicester 3614. "Woodworker, Leicester."

The Aeroplane Buyers' Guide

Acetylene Welding Plant—

Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—

Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation. Newcastle-on-Tyne."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2 City 7724.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.

Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1170. "Aircraft, Eastbourne."

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 2420. "Hydrophid, Crickle, London."

Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."

Martinsyde, Ltd., Brooklands, Byfleet. Woking 331; Byfleet 171. "Martinsyde, Weybridge."

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6735.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455 "Nieuscout, Crickle, London."

Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."

The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. Putney 2240-2241. "Carbodis, London."

Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerlyte, Knights, London."

Waring & Gillow, Ltd., Hammersmith, Museum 5000. "Warisen, Ox, London."

Westland Aircraft Works, Yeovil. Yeovil 129 "Aircraft, Yeovil"

White, J. Samuel, & Co., Ltd., East Cowes. Cowes 3. "White, East Cowes."

Airships—

Airships, Ltd., High Street, Merton. Wimbledon 1314.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, 'Phone, London."

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Bizfibild. London."

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.

The Witley Co., Ltd., Salisbury House, London Wall, E.C.2 City 2681-2. "Wrathless, 'Phone, London."

Cable Coverings and Cable Controls—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

Capstan Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1 Victoria 4670.

Castings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217 "Lucraftia, London."

Castings (Aluminium, Brass, Bronze, Machined or Rough)—

Coan, R. W., 219, Goswell Road, London, E.C.1 City 3846. "Krankases, Isling, London."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."

London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."

Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—

Accles & Pollock, Ltd. Oldbury, Birmingham Oldbury 111 (4 lines). "Accles, Oldbury."

B. D. V. Aircraft Spares, Syon Chambers, 162, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6 Hampstead 4728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aerracons, Canning, London."

The Osborne Aircraft Co., Ltd. Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—

British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree. Piccy, London."

British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3022. "Ajawb, London."

Clark Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic. London."

Elastic Cords—

Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—

Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. Midland 981. " Fahrenheit, Birmingham."

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines) "Ediswan, Enfield."

Electric Cables—

E. Kolker & Co., Coventry. Coventry 248 "Kolker, Coventry."

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford 1. "Pump, Bedford."

Arrol-Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."

The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000.

Beardmore Aero Eng. Ltd., 112, Great Portland Street, W.1. Gerrard 238. "Beamore, London."

Dudbridge Iron Works, Ltd. (Salmons), Victoria Street, London, S.W.1. Victoria 7000. "Aeroflight, Vic, London."

Gordon Watney & Co., Ltd., Weybridge. Weybridge 550 (7 lines). "Mercedes, Weybridge."

Green Engine Co., Ltd., Twickenham, Richmond 1293.

Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. Hammersmith 1272. "Gwynne, Hammersmith."

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2.

Sturtevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Morbeal, Wolverhampton."

The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W. Wallasey 408 (2 lines) "Elevenfold, London."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Flexible Shafts—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

Flying Schools—

Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. Bournemouth 616. "Etches, Winton."

Cambridge School of Flying & Aerodrome Co. Ltd., 30b, St. Andrews Street, Cambridge.

Galvanising—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Cowper-Coles & Manufacturing Co., Sunbury-on-Thames.

Gears—

Moss Gear Co., Ltd., Thomas Street, Aston, Birmingham. East 407. "Mosgear, Birmingham."

Glue—

Improved Liquid Glues Co., Ltd., Gt. Hermitage Street, E. (Croid.). Avenue 3784. "Excroiden, Wapp, London."

Mendine Co., 8, Arthur Street, E.C. Bank 4813.

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines). "Comyn, Ching, Westcent, London."

Chas. P. Kinnell & Co., Ltd., 65 & 52, Southwark Street, London, S.E.1. Hop 372 (2 lines). "Kinnell, London."

Instruments—

British Wright Co., Ltd., 33, Chancery Lane, Holborn, W.C.2

Instruments (Scientific, Altimeters, Speed and Pressure Gauges, etc.)—

Short & Mason, Ltd., Macdonald Road, Walthamstow, E.17. Walthamstow 58. "Aneroid," Phone, London

Machine Tools—

Brewster & Co., 12, Queen Victoria Street, E.C.4. City 768. "Circumfuse, London."

Magneto Driving Pieces—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

Magnetos—

The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. "Carlton, Coventry."

The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. Museum 430. "Vicksmag, Phone, London."

Metal Manufacturers—

Chas. Clifford & Sons, Ltd., Birmingham. Central 4243. "Clifford, Birmingham."

Metals in General—

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. " Poetry, Fen, London."

Metal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."

Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."

Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2297.

Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041. "Baylis, Wolverhampton."

The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

The British Gold Shell Ring Co., Ltd., Invernem Road, Hounslow, London. Hounslow 254. " Golshel, Hounslow."

Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. Museum 70. " Installing, Eusroad, London."

Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261. "Fremo, Birmingham."

Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."

Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aerracons, Canning, London."

Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

Metal Shearing Tools—

Montgomery, Smith & Co., Ltd., Tangent Works, Keynsham, near Bristol. Keynsham 21. " Ingenuity, Salford."

Metal Spinnings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."

Metric Bolts—

Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

Miscellaneous—

Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."

Asbestos Glass Co., Ltd., 78, Turnmill Street, E.C. Central 3731.

Bowden Wire, Ltd., Willesden Junction. Willesden 2400 (3 lines). "Bowlrellim, Harles, London."

Brown Bros., Ltd., Great Eastern Street, E.C.1. London Wall 6300. "Imbrowned, Bethroad, London."

Edison Swan Electric Co., Ponder's End. (Lamps.) Enfield 520 (6 lines). "Ediswan, Enfield."

Herbert Frood Co., Ltd., Chapel-en-le-Frith. Central 793. "Frodobrake, Birmingham."

Glamo Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.

London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."

MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—

Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."

Standard Motor Car Co., Coventry. Coventry 330 (4 lines). "Flywheel, Coventry."

Observation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Packers, Shippers, Etc.—

Lep Transport & Depository, Ltd., Castle Street, Long Acre, W.C Regent 5464. "Depotep, London."

Patent Agents—

King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.

Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.

Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Petrol Storage (Bulk)—

Bywater & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. Gerrard 2220. " Bywaterial, London."

Piston Rings—

British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—

Bliss, E. W., Co., 20, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissdon, London."

Presswork—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."

Integral Propeller Co., Ltd., Hendon 9, Kingsbury 104. "Aviprop, Hyde, London."

Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."

Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Stanley Aviation Co., 67, Kingsland Road, E.2. City 8347.

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil"

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—

C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. Chapeltown 474 "Instrument, Leeds."

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

The Norman Thompson Flight Co., Ltd., Middleton, Bognor Bognor 48. "Soaring, Bognor."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Short Bros., Rochester, Chatham 627. "Seaplanes, Rochester."

Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Shackles—

The British Gold Shell Ring Co., Ltd., Invernes Road, Hounslow. Hounslow 254. " Golshel, Hounslow."

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."

London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.

Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sheet Metal Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."

Shock Absorbers (Elastic Cord)—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—

Forward Motor Co., Summer Row, Birmingham. Central 6259.

Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igolter, Rugby."

Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—

Dart Spring Co., West Bromwich. West Bromwich 322 "Dart, West Bromwich."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."

Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—

Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."

Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—

Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—

John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London."

R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."

The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Westcent."

Varnishes—

Clark R. Ingham, & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Harland, W., & Son, Merton. Wimbledon 45.

Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."

Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Washers—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

Watchmakers and Jewellers (Silver Models)—

Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—

Barlmar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Barlquamar, Reg, London."

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."

London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—

Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wiremill, Musselburgh."

Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Wirework—

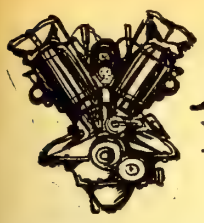
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

Woodworking Machinery—

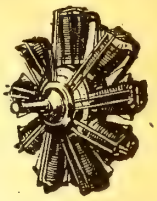
Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."

Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."

Wadkin & Co., 1 elcester, Leicester 3614. "Woodworker, Leicester."



AERO-MOTORS
IN KIND AND CONSTRUCTION



By Geoffrey de Holden-Stone

[Though large stationary oil engines are not precisely aero-motors, the following article by Mr. de Holden-Stone is included in this series on account of its relationship to other articles on two-stroke motors.—Ed.]

Some Points of the Petter Oil Engine.

"Not cheapness in its common sense, but cheapness born of excellence," reminiscent though it is of the apt phrasing of the late Dr. Samuel Watts—which was as cheap as it was excellent—is really a very fair epitome of at least one ideal of the two-stroke cycle. That is in a good example. The trouble is that so many designers forget that ideal, and introduce all sorts of mechanical complications, apparently for the sake of getting a working stroke out of every cylinder once in every shaft revolution, by some means different from any other, which, come to think of it, is like walking on your hands in full kit.

The thing can be done, of course; and one remembers, has to be done very rapidly to keep going at all. But acceleration and general walking efficiency are likely to be much inferior to the ordinary, heel-and-toe, four-stroke way, whereas really sound two-stroke design means stripping to the skin, shorts and shoes of motor-mechanism to get the very maximum of unencumbered movement.

Those that Do.

Messrs. Petter, of Yeovil, long ago recognised this. Also, that there are just two kinds of most humans and motors, those that do and those that don't. Of the then best-known type of two-stroker, the one that took carburant into its crank-chamber and the one that did not, but merely air instead. And that of the two, the former was impossible as a paraffin proposition; while the latter lent itself to at least two variations—the Evans method, by which the air under primary compression siphons up a dose of fuel as it runs through the transfer passage, and that other—of which the great inventor remains unidentified—that has its dose injected on the top of the compression-stroke.

The Fons et Origo.

Wisely, Messrs. Petter adopted both some years ago, in the Somersetshire way. People will tell you that the two-stroke cycle itself was invented in Somersetshire. Now I will concede that Gunpowder Plot, six-apple cider, medlars, laver, and shredded ham were all invented in Somersetshire.

But the two-stroke cycle was no more invented there than shirts at Crewkerne, gloves at Stoke, or flirtation at Bath: nor, so far as I remember, any particularly new fashion of original sin. Lancashire is solely to blame, in the person of one William Robson of Tangye's.

The Piston and Connecting-rod and Big-end of a Petter Two-Stroke Oil Engine.

Experientia Docet.

Nevertheless, on results—and the large list of more than satisfied customers their semi-Diesel type crude oil engines have served all over the world bears witness—I will agree that Messrs. Petter have combined in one design the merits of the high-compression Diesel type with those of the low-compression oil engine. Not that there is so much of the Diesel type about it, either. The chief merit to my mind is that it is really demi-semi-Diesel: all the few merits and none of the many complications of that Teutonic sham.

They have, further, got something which shows a better card on the whole than the much more expensive Körting or Ochelhauser, and a better consumption than either: and as a Day-type in the main, of course one with no valves, power-wasting valve-gear or other externals, and with the even torque that belongs to the cycle.

Simple Advantages.

Air, too, is still cheap in spite of the war and the Government; so it does not matter if the end-bearings shed a little: or if quite a lot pursues the exhaust out of the opposite port. In the crank-chamber, too, it may even help the lubricant to spread. It cannot mix with it and break it down as petrol does. And when the exhaust is done with, there is plenty left for a good m.e.p. ready to receive the vaporised pump-injected kerosene. Which, if merely atomised, would mix quite sufficiently with the compressed air to give a perfectly thorough combustion: this being distinctly an internal combustion rather than explosion motor.

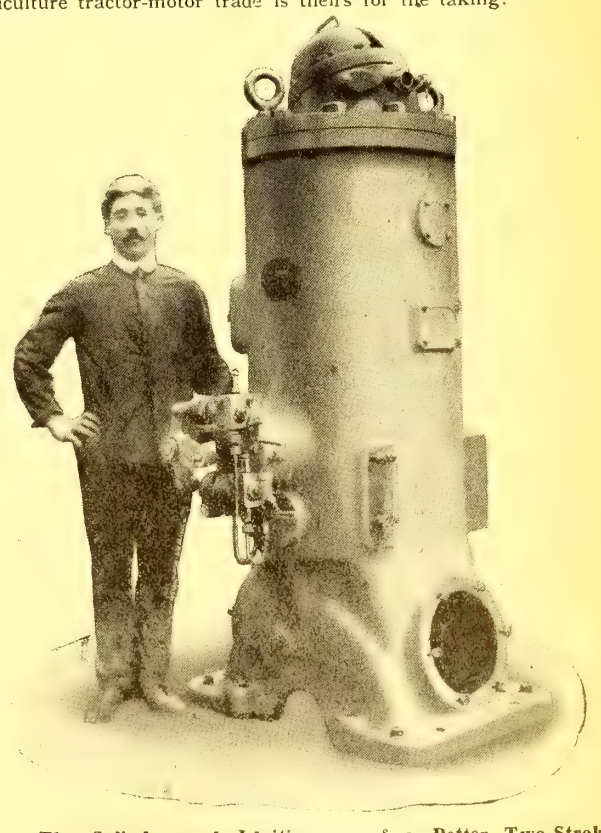
Sound Design.

All that forced feed-lubrication—with ring-oiling for the main-bearings—and ample, substantially made oil and water circulating pumps can do to make the Petter engine a full-load heavy-duty job has been done.

Also, to get thrust and torque stresses as even on one bearing as on the other, in all the single-cylinder models a good-sized counter-wheel has been put on the front end to oppose the fly-wheel and belt-drum mass weight.

The Needs of Agriculture.

In fact, such a simple, easily-looked after, reliable design is this, that if Messrs. Petter will but issue a duplicate of their VD or VK sizes, and lay it as a horizontal, twin or opposed, the agriculture tractor-motor trade is theirs for the taking.



The Cylinder and Ignition-cap of a Petter Two-Stroke Oil Engine.

They claim that the "verticality" of their design relieves the cylinder-walls from side thrust. Makers of vertical motors always do. But I suggest that if Messrs. Petter will take a second look at their own piston, and the long trunk of it, the high-set gudgeon-pin and hence the very easy angle of connecting-rod thrust, they will see that in these features, rather than in the erect position, lies the relief from side thrust they claim. Made on the same lines they could trust a horizontal type to be just as reliable, I am convinced.

But considering the special fuel-injection fashion of their cycle-variation, probably the best-studied and most appropriate feature of the design is the patent governor which simultaneously regulates the quantity of fuel-oil injection—and hence, too, the moment of injection—in proportion to the load. In this case the stroke of the rod-and-eccentric-operated, crescent-shaped rockers that depress the spring-load pump-spindles is not varied.

It could only be by varying their pivoting eccentrically, which might involve mechanical complication. Instead, the spindles themselves are held in freer or more restricted approach to the contact rollers of the rockers, so their stroke is greater or less.

At any rate, it manages to deal successfully with all the following oils:—Admiralty fuel oil, American refined petroleum, Anglo-Mexican fuel oil, Anglo-American fuel oil, Asiatic Petroleum Co.'s fuel oil, Assam crude petroleum, Borneo crude petroleum, Burmah crude petroleum, Disoil, gas oil (Great Britain), gasoleum, Grosny crude petroleum, Italian residue oil, Java crude petroleum, Mazout, Persian crude petroleum, Peruvian crude petroleum, Pennsylvanian crude petroleum, Resoleum, Rivadavia oil, Roumanian crude petroleum, Russian crude petroleum (naphtha), Russian refined petroleum, Shale oil (Scotland), Solar oil, Sumatra crude petroleum, Texas crude petroleum.

And having done so successfully with the heaviest of crudes without showing any deposit after weeks of running, the efficiency of the fuel-feed system and the completeness of the combustion appear to be conclusively proved. The freedom from electrical failure, the ignition being of the hot bulb kind, blow-lamp started and self-sustained by the repeated combustion, is also an advantage for any industrial service, wholly—to use the pet vulgarism of the aviation world—priceless.—G. DE H.-S.

The Case of Autogenous Welding—III.

BY ARTIFEX.

So far the proposition of autogenous welding sounds like a very formidable matter; one to be approached if not by prayer and fasting, at least not one for angels to rush in upon—at Notting Hill Gate or elsewhere—where plain male fools have feared to tread, advisedly. Still a little perpending of a few things—of how it gets its name, for instance—may assist. When it is understood that "autogenous" welding means the absolute union of two pieces of metal by *pure fusion*—that is to say, sufficient but not excessive softening of the parts in contact—and *without* the interposition of any foreign body or element, then the working scheme and its ideals will be comprehensively grasped.

Now the essential condition is that this sort of welding shall be effected, consequently, with some combustible which has no action on the metal such as carbonisation, quite apart from the oxidising already mentioned. Of all combustibles then, hydrogen *only*, so far, *completely* fulfils this condition: as was long ago clearly established by the French Society of Civil Engineers, to say nothing of workshop practice. Acetylene gas, on the other hand, has the fourfold inherent defects of carbonising the metal, volatising it and giving off carbonic oxide gas, as well as presenting greater danger of explosion.

On this last account alone, local authorities may object—they do in France—to welding installations using acetylene being set up without all sorts of vexatious if necessary restrictions. It is thus doubtful whether portability of the plant—one of the most attractive features of autogenous welding as an industrial proposition—would not thus be rendered out of the question.

Acetylene versus Hydrogen.

But here is the great technical difference: and the defect of acetylene. It has been claimed that oxy-acetylene welding is easier—than oxy-hydrogen, for instance—and more reliable because—another mere circumstantial claim—it is "easier to regulate." Yet one soon comes to see the hollowness of these claims, first, because there is nothing to prevent rapid-action regulating devices being invented and employed for oxy-hydrogen welding—in fact, the Société Oxyhydrique Française, of 2, Rue Nouvelle, Paris, has, or had, an entire outfit on these lines that worked perfectly; and secondly, because in the latter case the *proportions* of the gases in the flame can be varied fairly widely. This does not appear to be the case with acetylene, in which, apparently, the size of the *flame* and its intensity only can be varied.

So we see that this amounts to but a single regulation after all: and that it merely ensures a combustion *nearly* completed, that is, some 95 per cent. or so. Which "nearly" is again a mile off, or might as well be; for never being "quite," it is just that little difference which sets up that infinitesimal carbonisation that makes the weld nearly always brittle.

Not that the oxy-acetylene system is without its uses. Where no actual stresses exist, or are likely to be set up, there is no doubt as to its value: but those are not the conditions of aeroplane construction, apart from the water-jacketing of motors or the making up of manifolds.

The Absence of Carbon.

Hydrogen, on the other hand, displays a greater superiority over any other combustible gas—at present commercially available—for the purposes of autogenous welding. Because, giving in no circumstances the slightest carbon deposit, and, further, devouring all the oxygen it can get, one can use it in *excess* and so make the flame a reducing one without fear of deteriorating the metal chemically either by carbonisation or oxidation.

Whereas, with acetylene or any other gas in which carbon is present, once the metal is ever so slightly carbonised, it is irremediably carbonised. Again, with the latter, nothing is easier than to get an excess of oxygen into the flame, beyond what the acetylene takes up: which, of course, goes to oxidise the metal just to that slight extent that would never be noticed until the job was finished, and perhaps not then.

Thus one important test by a leading French metallurgical Society showed that of five samples of oxy-acetylene welding taken at random, four were slightly oxidised, and the fifth carbonised, which leads one to believe that the realisation of a true neutral flame—a regular result with oxy-hydrogen—is practically impossible with acetylene.

Electric Welding.

Again, more than one test of electric welding has shown that its defect is the difficulty—practically the impossibility—of regulating the heat. This is destructive to the solidity of the weld, which is rendered non-malleable. Whereas, to get a really sound autogenous weld, it is a cardinal rule never to work up to any heat beyond that at which the metal just runs slowly: the slower the better.

Here we get to the real bone of the matter. Most often, the two pieces to be welded are of the same metal; albeit one can just as well weld two different plain metals, *provided always* that their fusion temperatures are not very widely different. But it is in any case essential that the flame used shall be *chemically* neutral, and it will be easily seen not only that were that flame anything else, but that were the temperature excessively beyond fusion-point, that very excess-heat might well bring about chemical change owing to the presence of the surrounding atmosphere or its accidental impurities.

High-Tension Methods.

Originally, high-tension electric current was expected to afford the realisation of the always attractive idea of autogenous welding. Everybody who knows the history of these matters will recall the interesting apparatus constructed generally under the Elihu Thompson patents, which was installed in many big French engineering works that had powerful supplies of electricity available. Similarly in England.

Nevertheless, in spite of its technical interest—even its advantages for certain work such as riveting—electric welding did not become popular, and one may safely say, will not, for the following reasons. It requires, essentially, a considerable installation of electricity as a source of current: the handling of the electrodes is dangerous and inconvenient; the temperature—as has been said—is practically non-variable; and, finally, the intervention of the electric arc itself creates an immediate atmosphere positively charged with carbon: of all elements the most fatal to autogenous welding!

Thermit.

Then there was the famous "Thermit" process devised and patented in Germany, where scientific "education" is so high: real vision, and understanding of the fundamentals of a technical proposition in inverse ratio, one notices. Immediately everybody imagined that there at last was the simple solution of the autogenous proposition.

There was heat enough, and quick enough. In fact, that of the very Pit, ten times too much of it and too quick. Also necessitating all sorts of bother and complications in fitting the most accurate of moulds round the pieces to be welded. To have made the process effective, these moulds should have been given some approaching motion of the most gradual kind, like the follower-screw of a lathe, which, in the very nature of such welding, would have been mechanically impracticable.

Back to the Blowpipe.

So we have been brought back out of these clouds of experiment to the fact that the only possible practice for autogenous welding is that of the blowpipe: for one knows that by burning at the nozzle of a blowpipe a mixture of a combustible gas with

one that is active to combustion—such as oxygen—one can get any required temperature in the range of practice.

The active gas is, of course, always oxygen, either by itself—rarely, except for cutting work—or mixed with nitrogen to weaken it; in this case, of course, provided by the surrounding air; while the combustible gas is either hydrogen or its mixtures with carbon derivatives, such as town-gas, water-gas, acetylene, ether, oil-gas, etc.

Oil-gas, as one sees from the foregoing, is an "unlikely" mixture, only to be used when nothing else is available. Always the aim has been to find the means of producing, with a blowpipe, not only an absolutely neutralised flame with complete combustion, but also a *homogeneous* one: but the fear of explosions had mainly hindered the idea of making the mixture of two gases prior to their being lit. So they have been led by parallel—but always separate—channels to two nozzles converged one towards the other. So it is easy to see that in these circumstances the production of such a flame presented all sorts of apparent difficulties.

Thus it was an undoubted revolution in the welder's craft that the Société l'Oxyhydrique brought about when for the first time the mixture of the two gases was effected in the actual body of the blowpipe, before they were lit; thus creating the homogeneous mixture for the homogeneous flame, free of all carbonising influences, for the benefit of autogenous welding.

(To be continued.)

A PROMISING COMBINATION.

His many friends in the Aircraft Industry will be interested to know that Mr. J. D. North has been appointed designer to Boulton and Paul, Ltd., of Norwich. The combination should be of advantage to all concerned.

Boulton and Paul, Ltd., being, as their past history shows, thoroughly modern in all their ideas, have made up their minds that no matter when the war may end they intend to remain in the aircraft business and to secure a large share of whatever business is going, either in this country or abroad. They are also determined that the Boulton and Paul aeroplane which they will place on the market shall be an original production and not merely a reproduction of somebody else's designs. With such a policy in view, it is naturally necessary for them to secure a first-class designer, and in securing the services of Mr. J. D. North they have found a man with originality of idea and at the same time sound technical knowledge to balance his originality.

Mr. J. D. North.

Mr. North's technical career is distinctly of interest. He was educated at Bedford Grammar School and received his more highly technical instruction by private tuition. In his youth, for reasons of health, he travelled for six or seven months along the Mediterranean littoral and in Russia and Turkey, thus acquiring that breadth of view on international affairs which was the motive idea in those happy days when no gentleman's education was complete unless he had made the "Grand Tour."

On his return to England he served his time in the shops with a firm of general and marine engineers at Southampton, and later on he was employed in the shipyards on Queen's Island, Belfast. Between these periods he endeavoured to build an aeroplane in conjunction with Mr. H. A. Myers, now Captain, A.I.D. His first public operation in connection with aviation occurred when, in the early days of The Aeroplane, a competition was held in the form of an examination paper on purely practical technical points. The judge was Mr. W. O. Manning, one of the pioneers of scientific aeroplane design in this country, and at that time associated with Mr. Howard T. Wright. Mr. North won this competition with the greatest ease, obtaining full marks for practically every answer.

Possibly owing to the confirmation thus given of his knowledge of aeronautics, Mr. North left Belfast and decided to adopt aviation as a profession. He joined the Aeronautical Syndicate, Ltd., which had been formed some time before by Mr. H. C. Barber, now Captain, R.F.C., and he assisted in the manufacture of the Valkyrie machines. When the Aeronautical Syndicate expired, Mr. North joined the Grahame-White Co. in a technical capacity, shortly afterwards becoming chief designer, and later works manager.

Various machines, mostly successful, were produced by his efforts, and in 1913 he was elected an Associate Fellow of the Aeronautical Society. In 1915 he joined the Austin Motor Co. as superintendent of the Aeroplane Department, and has done much good work in that capacity, including the production of a small machine possessed of a remarkable performance. In 1917 he was elected Fellow of the Royal Meteorological Society.

Knowing something of Mr. North's ideas as to the performance necessary in war aeroplanes and as to the possibilities of machines which will give such a performance with adequate strength, one does not hesitate to prophesy interesting developments in his future designs.

SUNBEAM EMPLOYEES' CHARITY SPORTS.

The second annual Charity Sports, promoted by the employees of the Sunbeam Motor Car Co., Ltd., took place on August 18th in aid of local charities and organisations for wounded soldiers.

The results were as follows:—

100 Yards Girls' Flat Handicap.—1st, C. Evans; 2nd, M. Healy; 3rd, A. Davis.

100 Yards Flat Handicap (Employees).—1st, J. Lane; 2nd, W. H. Edge; 3rd, J. Oakley.

150 Yards Scholars' Flat Handicap.—1st, J. Pearson; 2nd, J. C. Hand; 3rd, L. J. Ford.

Half-mile Cycle Handicap (Employees).—1st, G. Sargent; 2nd, H. Justice; 3rd, T. Willetts.

Three Lap Works' Relay Race.—Winning team, Electric Construction Co.; 2nd team, Sunbeam A Team.

80 Yards Girls' Three-legged Race (Employees).—1st pair, M. Healy and C. Evans; 2nd pair, E. Stockton and S. Jones; 3rd pair, F. Smith and A. Morton.

Tug of War.—Winning team, Test House; 2nd team, Mr. Broadbent's Department.

Wounded Soldiers' Race.—1st, Cpl. Fergueson; 2nd, — Hope; 3rd, — Shipstone.

Comical Costume Parade.—1st, E. Williams; 2nd, G. H. Roulston.

220 Yards Works' Flat Handicap.—1st, W. Hindes; 2nd, J. Lane; 3rd, H. Cooper.

Half-mile Flat Handicap (Employees).—1st, W. Pace; 2nd, W. E. Harrison; 3rd, J. Oakley.

One Mile Walking Handicap (Employees).—1st, T. Roker; 2nd, J. H. Roulston; 3rd, W. Tomkinson.

One Mile Flat Handicap (Employees).—1st, A. Wakeman; 2nd, A. Hudson; 3rd, F. McCarthy.

100 Yards Flat Handicap (Open).—1st, W. Pearson, Willenhall; 2nd, J. A. Walkedon, Walsall; 3rd, H. May, Wolverhampton; 4th, J. Goodman, Walsall.

Half-mile Cycle Race (Open).—1st, J. Vincent; 2nd, W. Titley; 3rd, D. E. Owen.

One Mile Cycle Handicap (Open).—1st, W. Titley; 2nd, J. Vincent; 3rd, D. E. Owen.

220 Yards Flat Handicap (Open).—1st, W. Gill; 2nd, J. A. Walkedon; 3rd, J. Flint.

440 Yards Hurdle Handicap (Open).—1st, G. H. Shelton; 2nd, H. May; 3rd, F. A. Landucci.

At the conclusion of the sports the distribution of prizes was made by Mr. Clement B. Kay, the firm's works manager.

THE PATENTS INDEX.

The subjoined list of recent inventions has been specially compiled by The Aeroplane from the current Official Patents Records.

Patent Applications.

Austin Motor Co. Method of mounting aeroplane propeller and means for carrying gun which fires axially through propeller. No. 11,874. August 18th.

Blackburn Aeroplane and Motor Co. Appliances for manufacture of propellers for aircraft, etc. No. 11,868. August 18th.

Calthrop, E. R. Aeroplanes. No. 11,889. August 18th.

Coles, S. O. Cowper-. Door for aircraft sheets. No. 11,613. August 13th.

Coles, S. O. Cowper-. Metal wing for flying-machines. No. 11,614. August 13th.

Coles, S. O. Cowper-. Metallic propeller for aircraft. No. 11,616. August 13th.

Court, A. F. Aeroplanes. No. 11,701. August 15th.

Greeves, T. J. Transparent flexible fabrics or sheets for aeroplane wings, etc. No. 11,754. August 16th.

Halfhide, W. J. Cloud and night-flying instrument. No. 11,809. August 16th.

Hekimian, A. Hangar for aircraft. No. 11,679. August 14th.

Oddy, W. D. Propellers for aircraft. No. 11,694. August 14th.

Paulham, L. Propellers for aerial machines. No. 11,743. August 15th.

Reading, W. Aircraft stabilisers. No. 11,770. August 16th.

Spencer, A. C., and others. Balloons for signalling, etc. No. 11,714. August 15th.

Tarrant, W. G. Wings, etc., for aeroplanes. No. 11,850. August 17th.

Thompson, H. A. Device for tightening or loosening wires of aeroplanes, etc. No. 11,804. August 16th.

Complete Specifications Accepted, prints of which can be obtained on and after September 6th, 1917.

108,535. August 14th, 1916. Blackburn Aeroplane and Motor Co., and Sayers, W. Method and means of minimising the resistance of airships, marine vessels, and other bodies moving through fluid.

108,598. November 1st, 1916. Sopwith Aviation Co., and Sopwith, T. Wind screens for the pilot, observer, or gunner upon aircraft.

108,625. December 14th, 1916. Johnson, B. Steering and balancing of aeroplanes.

Abridgments of recently published Specifications.

107,208. Aeronautics. Robson, J., 38, Hawthorne Road, Bexley Heath, Kent.

Planes, construction of.—The wings of aerial machines are each provided between the upper and under sides and in front of the customary front spar with a forwardly facing step or surface which is adapted to compress and deflect below the wing the air passing under the leading edge. As shown applied to an aeroplane wing, the step is formed by a spar *g* secured at an angle to the front spar *e*. The upper surface *a* of the wing is continuous, but the lower surface *b* is discontinuous in front of the spar *g* so that the front face of the spar *g* is exposed to form a step. The step may extend beyond the end of the spar *g*, part of the front spar *e* being exposed to act as a step. The body of the aeroplane may be shaped to assist in deflecting air below the wing or a deflecting plate or plates may be attached to the body for this purpose. The step may be permanently exposed, or a hinged or flexible screen or screens *j* may be provided so that the step can be covered or exposed at will.

FIG. 1.

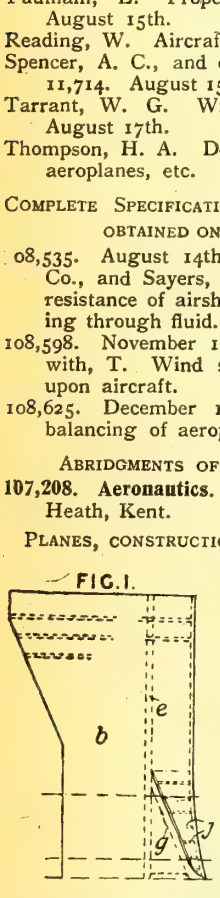
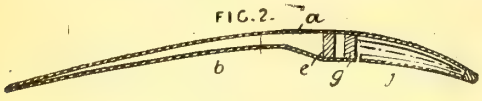


FIG. 2.



THE AIRCRAFT RAG.

The fourth issue of the "Aircraft Rag," the monthly works magazine of the Aircraft Manufacturing Co., Ltd., is as successful as were the earlier numbers. The illustrations and text continue to preserve a high standard, and the production is both instructive and amusing. The number of advertisements which the magazine now carries is quite surprising, and reflects the confidence with which the magazine is regarded, not merely by other aircraft firms, but by local tradesmen who are anxious to do business with the numerous employees of the A. M. Co., Ltd.

MARKET REPORTS.

Prices given are for quantities on usual terms.

August 23rd, 1917.

COPPER.—The chief interest centres round the situation in America. In the first place, the labour difficulties there are far from being settled, although one is given to understand that the Butte Council will probably accept the terms offered by the Anaconda Copper Mining Co. Secondly, the Washington authorities have not yet fixed the prices to be charged for metal required for war purposes. One is given to understand that the trouble in Spain is now affecting the Rio Tinto Mines, the men there having gone on strike. If the information is correct, then it is hoped that the dispute will soon be settled.

As forecasted in our issue of the 8th inst., there has been a further reduction in the price of Copper Ingot, but the prices of Electrolytic Sheets, etc., have not yet been adjusted. The whole position of this market is at present obscure.

Current Prices.

Standard Copper	£120 per ton, Cash.
Copper Sheets	£160 per ton.
Copper Tubes, S.D.	19¾d. per lb.
Brass Sheets, 24 Gauge	15⅝d. per lb.
Brass Tubes, S.D.	16½d. per lb.

TIN.—The business done in Tin has not been very brisk, in fact, a dull spell, which, however, has indications of only being temporary, has set in. America is getting her Tin from the Eastern markets, but the demands from that direction are not very great at present. The position here appears to be primarily influenced by the shipping situation, although there are other factors to be watched. It is likely that the market will become much firmer.

Current Prices.

August 22nd	£242	5	0
August 18th	243	0	0
August 14th	242	5	0
Highest Price, 1916	205	0	0

LEAD.—There appears to be plenty of Lead for war requirements. In spite of the labour difficulties in Spain, the official prices are, however, still maintained. The entire market is in a very dull condition.

Current Average Prices.

Pig Lead (Foreign)	£30	0	0
Last Year	29	3	9

STEEL.—The works are now in their stride again, and the long break for August Bank Holiday was certainly appreciated by both the masters and the men. The demand is undiminishing, in fact, it is increasing very considerably; this is particularly applicable to Aircraft Steels. The output of the latter is very favourable. There is, however, a very grave shortage of one or two special Steels. There has been no alteration in prices for some considerable time, and there does not appear to be any indications of any alterations at present. Cast Steel continues to advance in price, and it is more than likely that it will continue to do so. The Air Board have not yet officially notified manufacturers of the prices to be charged for the Steels they are controlling.

Current Average Prices.

R.A.F. 3B Steel, 36s. to 40s., per cwt. Basis. (Black or Blue Reeled).

R.A.F. 1E Steel, 78s. to 80s. per cwt. Basis. (Black or Blue Reeled).

R.A.F. 9A Steel, 30s. to 32s., per cwt.

ALUMINIUM.—Supplies are very satisfactory indeed, and the official prices remain unaltered.

Official Prices.

Ingot	£225 per ton.
Remelted	210 per ton.

TIMBER.—The Timber position is still very acute, in fact, it is now practically impossible to procure the wood which is more extensively used in aircraft construction, viz., Silver Spruce.

One is given to understand that the A.I.D. are exercising a stricter "cast-iron" inspection of wood parts, and there does not appear to be any hope of them modifying it. One is not advocating the use of unsatisfactory wood, but in view of the shortage of Timber, due in one's estimation to inefficient and short-sighted control, one suggests that there are reasonable grounds for the inspection of wood parts; the A.I.D. have apparently reached the utmost bounds of the unreasonable. About 20 per cent. of the material which has been imported by the Air Board is suitable for making parts to pass present-day A.I.D. Inspection. It will be observed that the position is getting very desperate, and manufacturers are anxiously waiting for developments.

There is still a serious shortage of Walnut, and although there are supplies of Mahogany to be procured, one would like to see larger shipments of first-class material arriving. Prices of all

woods continue to advance; this is particularly applicable to Mahogany.

Current Average Prices.
Silver Spruce, 17s. 6d., c.f.
English Ash, 13s. 6d. to 15s., c.f.
Walnut, 2s. 3d. to 2s. 6d., s.f.
Mahogany, 2s. 2d. to 2s. 4d., s.f.
Prices include selection and delivery.

FABRIC.—There are ample supplies at present of both Fabric and Spaced Material. There are also fairly good supplies of Egyptian and India Tapes. Is it a fact that the Air Board are making 10 per cent. profit on all Fabric, and Missed Thread Cloth delivered to aircraft firms? If this is correct, it would be interesting to know what this 10 per cent is for, seeing that the material is delivered direct by the spinners, and the Air Board have no handling, packing, or delivery charges to bear. The price is certainly atrocious, and one understands that the spinners consider it is a downright swindle. One gives below a comparison of prices. Careful comparison will, one thinks, confirm the Belfast spinners observations.

Comparison of Prices.
17C Cloth, 36 in. wide.—Feb., 1917.....2s. 8d.
(Official price fixed August, 1917, presumably retrospective.)
17C Cloth, 36 in. wide.—Nov., 1916...1s. 11¾d.
17C Cloth, 36 in. wide.—Feb., 1916 .....1s. 9d.
The above prices cover 17B and C Cloth.

THE AUSTIN TECHNICAL SOCIETY.

A meeting was held recently of the Austin Technical Society, which was founded on May 2nd with the object of promoting among the Austin Co.'s employees the study of engineering and other branches of applied science. The President of the Society is Mr. Herbert Austin, who is not only one of the pioneers of motoring in this country, but has also long been keenly interested in aeronautics.

At the recent meeting the Hon. Organising Secretary, Mr. A. E. Astington, explained that it was obviously impossible to get into full working order at once. As soon as the officers were appointed, the Management Committee proceeded to form sub-committees to deal with the three most important matters in connection with the Society, viz., the formation of the Library, the arrangement of a series of lectures and the establishment of technical education for the members. It can easily be seen that much time and thought had to be devoted to the consideration of these vital matters, and the Sub-Committee thus formed had been most unremitting in their labours.

The Library, as being the most obviously useful of the Society's operations, demanded first consideration. Very considerable progress has been made, and already many books have been received. In addition, the Chief Librarian to the Birmingham Corporation (Mr. Walter Powell) has been consulted and has prepared a list of standard works on subjects submitted to him by the sub-committee, and the assistance which this gentleman has voluntarily given has been of the greatest value to the Society.

The Society is also receiving regularly a number of high-class technical journals. A list will shortly be prepared and circulated amongst the members, pending the provision of suitable library and reading-room accommodation, though it is hoped that this will very soon be available.

It was not possible at the moment to arrange for the issue of books and periodicals, as the necessary machinery, though in course of preparation, was not yet ready.

As to the scheme of lectures for the forthcoming session, it is hoped to arrange for the highest authorities on their particular subjects to address the Society, and negotiations have already been opened to this end, but it would be premature to give details yet.

Members, however, can give assistance to the Lecture Sub-Committee by making suggestions as to subjects which might form the basis of discussion between members of the Society, as the feeling of the Committee is that debates are both helpful and instructive, and by such means members can become better acquainted with one another than is possible where they are addressed by a lecturer unknown to them except perhaps by name.

Technical education has also received the earnest consideration of a sub-committee, and negotiations are in progress with the City of Birmingham Education Committee to give instruction to those members desiring it in a very wide range of technical subjects at specially low fees. It is also probable that courses of tuition, conducted by one of the largest correspondence schools in the country, will be instituted, and in this connection members will be glad to hear that this particular school has most generously given to the library a complete set of its instruction books, comprising 75 volumes, which will be especially valuable to the younger members.

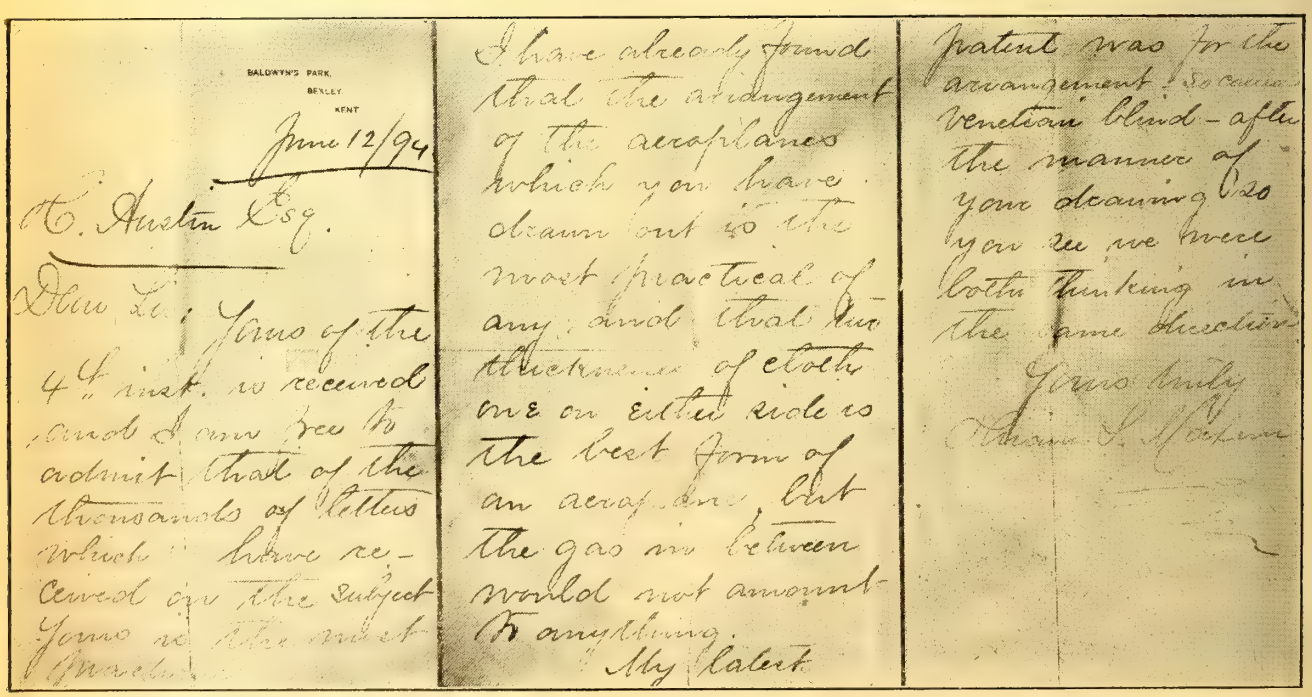
The Advisory Council is in process of formation and numbers, up to the present, 29 members, representing each branch of activity carried on in the works. The Committee hope that any member, of whatever grade, who considers that he is qualified to give advice on any subject, or wishes to nominate another member to a seat, will communicate with the Secretary at once.

Forms of application for membership are now ready, and can be obtained either from the Secretary or through any member of the Committee.

THE DAVIDSON AVIATION CO.'s OUTING.

The Davidson Aviation Co., Ltd., held their first annual works' outing on Saturday, August 18th.

The party left Richmond at 9.30 a.m., and except for a few showers in the early morning, it turned out to be a glorious day. Lunch and tea were supplied at the "Cricketers Arms" at Chertsey. A sports' programme was arranged for the afternoon, and this was carried out very successfully, the main feature of which was the "tug-of-war" for the men and the girls. The directors presented a silver cup to the winning team, and each man of the successful team received a pipe. The cup will be held by the winners for 12 months.


BALDWYN'S PARK,
BEXLEY
KENT

June 12/94

H. Austin Esq.

Dear Sir, Yours of the 4th inst. is received and I am free to admit that of the thousands of letters which I have received on the subject Yours is the most practical of any; and that the attachment of cloth one on either side is the best form of an aeroplane, but the gas we between would not amount to anything.

My patent was for the arrangement of a Venetian blind - after the manner of your drawing, so you see we were both thinking in the same direction.

Yours truly
Hiram S. Maxim

AN INTERESTING RELIC.—A letter from the late Sir Hiram Maxim to Mr. Herbert Austin, now of the famous Austin Motor Co., Ltd. The letter demonstrates Mr. Austin's early interest in aviation and his practical ideas on aeroplane design twenty-three years ago.

(*Continued from page* 578B.)

and reconnaissance work was also carried out. In the course of the day and night five tons of explosives were dropped on various objectives behind the enemy's lines.

August 25th, 9.29 p.m.—The customary work of our aeroplanes was continued yesterday in spite of unfavourable weather and high westerly winds. The enemy's aircraft showed little activity. In air fighting one German aeroplane was brought down and one other driven down out of control.

Three of our machines are missing.

August 26th, 9.34 p.m.—Owing to stormy weather there was little aerial activity yesterday until the evening, when successful artillery work was carried out by us with aeroplane observation, and some fighting took place. Three German machines were brought down and four others driven down out of control.

Two of our aeroplanes are missing.

August 27th, 9.30 p.m.—Bombing raids and observation work for our artillery were carried out vigorously yesterday by our aeroplanes, and the enemy's batteries, transport, and infantry were effectively engaged with machine-gun fire.

During the fine intervals the enemy's aircraft were active and aggressive. In air fighting, four German aeroplanes were brought down and three others driven down out of control.

Two of our machines are missing.

War Office Communiqué.

August 24th.—The G.O.C. the British Forces in Macedonia reports:—

During the past week our aeroplanes have dropped bombs on the enemy's dumps at Sarmusakli (south-east of Seres), Dutli (north of Seres), and Demirhissar (all places on the Struma front). We have also, in conjunction with Allied machines, raided Prilep (north of Monastir) and neighbouring places.

Home Command Communiqués.

August 22nd, 11.15 a.m.—Enemy airships—numbers not definitely ascertained—appeared off the Yorkshire coast last night.

One of the raiders attacked the mouth of the Humber, and was fired on by anti-aircraft guns. She dropped some bombs and then made off to sea.

The damage so far reported is slight, but one man was injured.

4.10 p.m.—Later reports show that, although a number of enemy airships approached the Yorkshire coast last night, only one, or at most two, ventured to come overland.

Twelve high explosive and 13 incendiary bombs were dropped at three small villages near the coast; a chapel was wrecked and several houses damaged.

One man was injured.

August 22nd, 1.10 p.m.—Ten enemy aeroplanes approached the Kentish Coast near Ramsgate at about 10.15 a.m.

Being met and heavily engaged by machines of the Royal Flying Corps and Royal Naval Air Service, as well as by gunfire from anti-aircraft guns, the raiders were unable to penetrate inland.

A small party travelled west as far as Margate, but then turned homeward. The remainder skirted the coast to the south as far as Dover.

Bombs were dropped at Dover and Margate.

Casualties reported at present are three persons killed and two injured. The material damage is slight.

Two of the enemy machines were brought down by anti-aircraft gunfire and our own aeroplanes.

3.35 p.m.—The latest police report shows that bombs were dropped by the raiding aeroplanes this morning at Dover, Margate, and Ramsgate.

No casualties occurred at Margate, but at Dover and Ramsgate 11 persons were killed and 13 injured. A hospital and a number of houses were damaged.

One of the enemy pilots was rescued, having been only slightly injured.

The Casualty List.

Reported August 22nd.

Killed.—Meudell, Sec. Lt. C. G., R.F.C.

Previously reported Missing, now reported Killed.—
Bates, Sec. Lt. A. H., R.F.C.
Brandon, Lt. E. T. C., R.F.C.
Muir, Sec. Lt. J. H., R.F.C.
Pell, Sec. Lt. H. S., R.F.C.
Powell, Lt. P. J. B., A.S.C., attd. R.F.C.
Sworder, Lt. H. P., R.W. Surrey R., attd. R.F.C.
White, Sec. Lt. B. W., Liverpool R., attd. R.F.C.
Williams, Sec. Lt. V. F., R.F.C.

Accidentally Killed.—Sheehan, Lt. C., R. Muns. Fus., attd. R.F.C.

Wounded.—Binnie, Lt. A., R. Scots, attd. R.F.C.
Edmunds, Lt. P. M. L., Lancers, attd. R.F.C.
Jones, Sec. Lt. E. T. L., R.F.C.
Long, Sec. Lt. J. T., Middx. R., attd. R.F.C.
Mitchell, Capt. J., M.C., R.A., attd. R.F.C.

Missing.—Barlow, Sec. Lt. A. N., R.F.C.
Calder, Lt. A., Oxf. and Bucks. L.I., attd. R.F.C.
Collis, Sec. Lt. D. P., R.F.C.
Fleming, Capt. W. A., M.C., Devon. R., attd. R.F.C.
Henderson, Sec. Lt. J. F., R.F.C.
Hutchinson, Lt. C. D., S. Staff. R., attd. R.F.C.
Mallous, Sec. Lt. C. G., R.F.C.
Oliver, Sec. Lt. S. J., R.F.C.
Ward, Sec. Lt. E. S., Oxf. and Bucks. L.I., attd. R.F.C.

Previously reported Missing, now reported Prisoners in German Hands.—Harker, Sec. Lt. G. T., R.F.C.
Stevens, Lt. E. H., E. Lan. R., attd. R.F.C.

Canadian Contingent.—Accidentally Killed.—Brown, Lt. E. C., E. Ont. R., attd. R.F.C.
Montgomery, Lt. C. C. S., B.C., Regt., attd. R.F.C.

Missing.—Sawlor, Lt. R. H., N.B. Regt., attd. R.F.C.

Previously reported Missing, now reported Prisoner in German Hands.—Weld, Lt. D. S., W. Ont. R., attd. R.F.C.

Reported August 23rd.

Previously reported Wounded now reported Died of Wounds.—Gordon, Sec. Lt. A. W., R.F.C.

Wounded.—MacKerron, Sec. Lt. D. A., A. and S. High. and R.F.C.
Nicholl-Carne, Sec. Lt. T. M., R.F.C.
Treadwell, Lt. R. N., R.F.C.
Wells, Sec. Lt. G. A., R.F.C.

Missing.—Biederman, Sec. Lt. H. E., Yeo. and R.F.C.
Chambers, Capt. P. W., R.F.C.
Davies, Lt. D. B., R.F.C.
Jeff, Sec. Lt. R. N. W., R.F.C.
Jarvis, Capt. A. B., Middx. R. and R.F.C.
Read, Capt. H. E., Yeo. and R.F.C.

Correction.—Missing.—Nickalls, Lt. H. G., Yeo. and R.F.C., should read Nickalls, Lt. H. Q., Yeo. and R.F.C.

Australian Force.—Previously reported Missing, believed Killed, now reported Killed.—Searle, Sec. Lt. A. H., F.C.

Reported August 24th.

Previously reported Wounded now reported Died of Wounds.—Snowden, Lt. H. J., S. Lan. R., attd. R.F.C.

Wounded.—Ardley, Lt. E. L., R.F.C.
Bent, Sec. Lt. H. K. R., M.C., R.F.A., attd. R.F.C.
Frost, Capt. G. W., Sher. For., attd. R.F.C.
Hamer, Sec. Lt. H. W., Lan. Fus., attd. R.F.C.
Maturin, Sec. Lt. W. H., R.F.C.
Muncaster, Sec. Lt. A. E., R.F.C.
Nuttall, Lt. W., Lan. Fus., attd. R.F.C.
Orchard, Sec. Lt. H., Wilts R., attd. R.F.C.
Pender, Capt. J. McA. M., Sea. High., attd. R.F.C.
Webb, Sec. Lt. P. F. H., R.F.C.

Missing.—Colledge, Sec. Lt. G., Yeo. and R.F.C.
Elliott, Sec. Lt. C. W., R.F.C.
Guy, Lt. C. G., North'd R. and R.F.C.
Harris, Sec. Lt. P. G., R. Welsh Fus., attd. R.F.C.
McLaren, Sec. Lt. F. M., R.F.C.
Nichols, Sec. Lt. S. L., R.F.C.
Read, Sec. Lt. L., R.F.C.
Sillem, Sec. Lt. S., R.F.C.
Ward, Lt. E. A. H., W. Yorks R. and R.F.C.
Williams, Capt. R. M., R. Welsh Fus., attd. R.F.C.

Reported August 25th.

Killed.—Hay, Lt. D. Y., R.W. Kent R. and R.F.C.
Holaway, Sec. Lt. C. E., Yeo. and R.F.C.
Kirk, Sec. Lt. P. G., Camb. R. and R.F.C.

Wounded.—Cawley, Sec. Lt. J., Manch. R., attd. R.F.C.
Davies, Lt. W. H., R. Scots., attd. R.F.C.
Gardner, Capt. C. H., R.F.A. and R.F.C.

Missing.—Cullen, Lt. W. D., E. Surr. R. and R.F.C.
Fullalove, Sec. Lt. G. T., R.F.C.
Tinney, Sec. Lt. H. G., R.F.C.

Reported August 27th.

Killed.—Goodman, Sec. Lt. J. E., R.F.C.
Phipps, Sec. Lt. C. L., R.G.A., attd. R.F.C.

Previously reported Wounded, now reported Died of Wounds.—Gordon, Sec. Lt. A. W., R.F.C.

Wounded.—Brookes, Sec. Lt. W. R., R.F.C.
Drake, Sec. Lt. M. H., R.F.C.
Lowenstein, Sec. Lt. J. C., R.F.C.
McLean, Sec. Lt. I. M., R.F.C.
Maplestone, Sec. Lt. A. N., R.F.C.
Pritchard, Sec. Lt. E. W., R.F.C.
Sandy, Sec. Lt. B. F., R.F.C.
Smith, Sec. Lt. C. K., R.F.C.
Trench, Sec. Lt. C. F. Le P., R.F.C.
Waite, Lt. H. L., R.F.C.

Missing.—Cameron, Lt. P. G., R.G.A., attd. R.F.C.
McGavin, Sec. Lt. P. L., R.F.C.
Moore, Lt. C. G., R.F.C.

Oliver, Capt. T. A., R.F.C.
Page, Sec. Lt. D. A., Ches. R., attd. R.F.C.
Pender, Capt. W. G., M.C., R.F.C.
Snelgrove, Sec. Lt. H. D. B., R.F.C.
Young, Lt. J. G., Leins. R., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Don, Capt. F. P., Yeo. and R.F.C.

AUSTRALIAN FORCE.—WOUNDED.—Forrest, Lt. H. G., Fl. C.
Taylor, Sec. Lt. H., Fl. C.

Reported August 28th.

KILLED.—Kebblewhite, Sec. Lt. F. E., Sher. For. and R.F.C.
Reincke, Capt. L. F., D. of Well. R., attd. R.F.C.

DIED OF WOUNDS.—Barlow, Sec. Lt. C. A., R. Suss. Rr., attd. R.F.C.
Robertson, Sec. Lt. A., R.F.A., attd. R.F.C.

ACCIDENTALLY KILLED.—Bruce, Sec. Lt. R. S. M., R.F.C.

WOUNDED.—Arnold, Sec. Lt. H., R.F.C.
Barnes, Capt. J. S., R.F.C.
Bawden, Lt. A. J. F., Durh L.I., attd. R.F.C.
Douglas, Sec. Lt. J., R.E., attd. R.F.C.
Grimwood, Lt. B. C. R., R.F.A., attd. R.F.C.
Luxton, Sec. Lt. H. D., R.F.C.
Mason, Lt. R., K.O.Y.L.I., attd. R.F.C.
Molyneux, Sec. Lt. E. T., R.F.C.
Nixon, Sec. Lt. J. H. C., R.F.C.
Robinson, Sec. Lt. T. N., R.F.A. and R.F.C.
Stevenson, Lt J. S., A.S.C., attd. R.F.C.

MISSING.—Baker, Sec. Lt. A. R., R.F.C.
Chivers, Sec. Lt. W., R.F.C.
Cornford, Lt. R., R.F.C.
Field, Sec. Lt. N., Manch. R. and R.F.C.
Gordon, Lt. D., A. and S. High. and R.F.C.
Hudson, Capt. A. R., Yeo. and R.F.C.
Shipwright, Sec. Lt. A. T. K., R.F.C.
Smith, Sec. Lt. G. M., A.S.C., attd. R.F.C.
Smith, Sec. Lt. J. B., Black W. and R.F.C.
Thomas, Lt. C. R., R.F.C.
Townsend, Sec. Lt. D., R.F.C.
Webb, Capt. N. W., M.C., R.F.C.
Wilkinson, Lt. D. S., R.F.C.
Williams, Sec. Lt. W. H. T, R.F.C.

AUSTRALIAN FORCE.—WOUNDED.—Lewis, Sec. Lt. O. G., Fl. C.

* * *

CASUALTIES AMONG WARRANT OFFICERS, N.C.O.'s AND MEN. The dates are those of the official list.

KILLED.

AUGUST 14th.—Lloyd 11369 2nd Cl. Air Mech. W. M. (Leyton, E.)
AUGUST 17th.—Evans 13840 1st Cl. Air Mech. T. (Bolton).

DIED OF WOUNDS.

AUGUST 17th.—Sowerby 12805 1st Cl. Air Mech. J. (Kendal).

DIED.

AUGUST 17th.—Carter 36339 A. (Finchley, N.); Shonfield 5566 Cpl. L. A. R. (Denmark Hill, S.E.); Tree, 47330 G. (Newhaven).

WOUNDED.

AUGUST 14th.—Mee 65250 Cpl. S. A. (Lewisham, S.E.); Weldon 5084 1st Cl. Air Mech. J. G. (Liverpool).
R.F.C. attd. R.A.—Wilson 9223 1st Cl. Air Mech. N. (Bangor).
AUGUST 15th.—Kemp 11580 2nd Cl. Air Mech. L. G. (Southampton); Shewan 52416 2nd Cl. Air Mech F. A. (Ilford); Sims 20037 1st Cl. Air Mech. G. A. (Tottenham, N.).
AUGUST 17th.—Allen 15737 1st Cl. Air Mech. A. J. (St. Albans); Edwards 10043 Sgt. S. W. (Wandsworth, S.W.); Hodson 6774 1st Cl. Air Mech. T. (Doxey); Humphrey 9171 2nd Cl. Air Mech. E. T. (Kennington, S.E.); Kay 7463 2nd Cl. Air Mech. J. W. (Wolverhampton); Phillips 44748 2nd Cl. Air Mech. R. (Wimbledon, S.W.); Towers 9747 1st Cl. Air Mech. J. (Garstang); Venn 8977 1st Cl. Air Mech. A. R. (East Ham, E.).
AUGUST 18th.—Crossley 22135 2nd Cl. Air Mech. H. (Rochdale); Davies 44980 2nd Cl. Air Mech. H. V. (Machen); Ferguson 23672 2nd Cl. Air Mech. A. J. G. (Exeter Street, W.C.); Giles 9237 1st Cl. Air Mech. A. E. (Putney, S.W.); Gurney 9216 2nd Cl. Air Mech. E. O. (Taplow).
R.F.C. attd. R.G.A.—Davison 43692 2nd Cl. Air Mech. S. C. (Swindon).

MISSING.

AUGUST 17th.—R.F.C.—Wickham 27234 Cpl. W. S. (Norwich).
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR IN GERMAN HANDS.—AUGUST 14th.—R.F.C.—Lloyd 78758 2nd Cl. Air Mech. C. (Swansea).

PERSONAL NOTICES.

DEATHS.

BROOKS.—Sec. Lt. Francis Cyril Brooks, R.F.A., attached R.F.C., who was killed on August 17th in a flying accident, was the elder son of Capt. and Mrs. J. C. Brooks, Sarsdenfield, Camberley. He was 19 years of age.

BROWN.—Lt. Ewart Cudemore Brown, Canadian Infantry, attd. R.F.C., who was killed while flying in England at the age of 24, was the eldest son of Mr. and Mrs. V. O. Brown, of St. George's, Bermuda, and nephew of Mr. and Mrs. C. H. Cudemore, of Loughton, Essex. He was born in St. George's, Bermuda, and after leaving school went to the British Bank of Montreal, where he was when war was declared. He enlisted in the company formed by the McGill Institute, Montreal, of which he was a member, and after training in England he went to the front early in 1915. He was invalided home, and afterwards served in the Accountants' Department of the Canadian Pay Office. He again volunteered for the front, joining the Cadets and gaining his commission. Later he was attached R.F.C., and it was during his first flight alone that he was accidentally killed.

BRUFTON.—Sec. Lt. Harold Charles Brufton, Rifle Brigade and R.F.C., killed in a fight in the air on July 8th, was the third son of Mr. Harry D. Brufton, of Croftdown, Wanstead. After serving a short time in France he went to Egypt on January 3rd, 1916 (his 21st birthday), and joined the R.F.C. in November following. He took part in numerous raids with his squadron and had several fights with enemy machines.

CASTELL.—First-Class Air Mech. G. C. Castell, R.F.C., was killed in a railway accident when returning after completing a machine-gun course in preparation for a commission as a flying officer. Mr. Castell, who was 24 years old, was a trained engineer, who had served his time in the shops, and was engaged as a draughtsman at the outbreak of war. Within the first few weeks he joined the London Regt. as a private, going to the front at the beginning of 1915, and seeing hard fighting at Givenchy, Loos, and elsewhere. After about 18 months of this service he was transferred to the R.F.C. for the repair and maintenance of aeroplanes, and had been recommended for the commission for which he was preparing at the time of his death. His C.O. bears testimony to his keenness both as a soldier and as a mechanic, and the head of the works at which he served his time records an exceptional combination in him of an amiable and peaceful disposition with a relentless attachment to his duty. Mr. Castell, who was a vigorous Rugby footballer and on service became an excellent shot, was the only child of Mr. G. H. Castell, for many years engaged in the service of the Surrey Commercial Docks.

CLIFTON.—Sec. Lt. William Gerard Talbot Clifton, Oxford and Bucks Lt. Infty. and R.F.C., who died of wounds on March 31st, 1917, while a prisoner of war at the field hospital at Corbehem, was the eldest son of Mr. and Mrs. W. C. Clifton, of Stoke Poges, Bucks, and 21, Elm Park Gardens, S.W.

COBB.—Lt. John Elbridge Cobb, A.S.C., attached R.F.C., who was killed in action on August 14th, was the elder son of Mr. and Mrs. John Austin Cobb, late of Richmond, Surrey. He was 20 years of age.

CRAIG.—An inquest was held on August 22nd at Ilford on Lt. George Robert Craig, M.C., East Lancs. Regt., attd. R.F.C., who was killed in an Essex aerodrome on August 19. Capt. McKay said that the deceased officer was an experienced aviator, and had been up for forty minutes previous to the accident. The machine was in perfect condition, and Mr. Craig went up a second time and engaged in fighting practice with his Flight Commander. After manœuvring for some time the pilot came down a thousand feet in a spin. He recovered himself from this, but immediately the machine began to spin in the opposite direction and crashed to earth. Dr. Brought, who witnessed the accident, expressed the opinion that Mr. Craig must have fainted in mid-air. Death was instantaneous. The jury returned a verdict of death by misadventure.

DIXON.—Capt. Henry Eric Dixon, Middlesex Regt., attached R.F.C., who was accidentally killed while flying, on August 19th, was the eldest son of the late Albert Edward Dixon, solicitor, Cardiff, and of Mrs. H. B. Dixon, of Downton House, Stonehouse, Gloucestershire. After being educated at Waynfleet and Bradfield College, he was at Leeds University, then at the Wolseley Works, Birmingham, and later with the Cleveland Bridge Engineering Company. On the outbreak of hostilities he joined the Public School Corps, and was given a commission in the Middlesex Regt., being later transferred to the Royal Flying Corps, in which he obtained his wings with distinction, and at the time of his death was Acting Flight Commander. He was married only nine months ago to Miss Muriel Agnes Seymour Metford, younger daughter of Lieut.-Colonel F. K. Seymour Metford, R.F.A., and she survives him.

DOW.—An inquest was held at Dartford on August 25th on the body of Lt. Allan G. Dow, R.F.C., a Canadian who, on August 16th, while flying, came into collision with another machine and fell into the River Thames and was drowned. The body was recovered on August 23rd.

Major R. F. Maxwell said Mr. Dow came from Ottawa. When 1,000 ft. up he came into collision with a machine, the pilot of which was rescued and is now in hospital suffering from shock. From his statement it appeared that he was doing a "spiral"

from 2,500 ft. up and he did not see the other machine till he was five yards away from it. He tried to escape collision but failed, and Mr. Dow's machine nose-dived into the river and was completely wrecked.

Several jurymen asked questions with reference to the number of recent flying accidents, and whether the machines were "dud" ones, but it was stated that the machines could not be bettered for purposes of instruction. A question as to whether the pilot was playing "fancy games" when the accident occurred was answered in the negative.

A verdict of death from misadventure was returned.

FULLALOVE.—Sec. Lt. G. Y. Fullalove, late H.A.C., who was killed in action on August 13th at the age of 20, was the son of Lt. and Mrs. Fullalove, of Inglenook, Coulsdon, Surrey.

HARRIES.—At Angmering, West Sussex, on August 21st, Lt. Harries was killed by his machine falling into a meadow on the Ecclesden Farm estate. From the nature of his injuries death must have been instantaneous.

HUNT and FINLEY.—It was reported from North Wiltshire on August 22nd that Lt. Alfred Stanley Hunt, R.F.C., and Sgt. Charles Finley, R.F.C., have been killed as the result of a collision in the air between two aeroplanes. Their machine came into collision with another aeroplane, the pilot of which had a remarkable escape, for, although the propeller of his machine was broken, he managed to land in safety.

JORDAN and HANDLEY.—Mr. Gilbert H. White, Coroner for West Surrey, held an inquest at Addlestone on August 22nd on Lt. Hugh Stewart Latimer Jordan, R.F.C., and Sgt. E. Handley, R.F.C., whose deaths were announced last week. Describing the accident, John Hoare, a gardener at The Grange, said about 10 o'clock on August 20th he saw two machines in the air, one above the other. Suddenly there were two explosions, and the lower machine came straight down for some distance, when it straightened out, and then the right wing folded back onto the body of the machine. It next took a horizontal course for some distance with one plane, which also suddenly folded back. The machine then pitched over some trees into a field. Witness ran across and found Mr. Jordan and Sgt. Handley under the engine dead.

Evidence was given that the machine was in perfect order when it went up from Brooklands aerodrome. Capt. Cecil Faber, R.F.C., said Sgt. Handley was acting as pilot and was instructing Mr. Jordan as an observer. Lt. Barrie Young, R.F.C., said he saw the machine come down with a spinning dive from 3,000 ft. A verdict was returned in each case of death from misadventure.

Mr. Jordan was a son of Mr. H. S. Jordan, Napier Road, Wembley. He joined the H.A.C. in January, 1915, and went to Egypt in the following May, returning to England last year. He was then given a commission in the Reserve of Officers in the Field Artillery. After serving in France for seven months he returned to England, and was being trained as an observer when he was killed. Sgt. Handley had flown in France and had received the Médaille Militaire from the French Government.

KEBBLEWHITE.—Sec. Lt. Fred E. Kebblewhite, Sherwood Foresters, attached R.F.C., who was killed in action on August 14th, was the son of Mr. and Mrs. James Kebblewhite, of Sydney, Australia. He was 30 years of age.

KEYSER.—On August 22nd Lt. Keyser, R.F.C., was flying at Hounslow when, from an unexplained cause, his machine nose-dived into a field at Heston. The aviator, seriously injured, was taken in an unconscious condition to hospital, where he died soon afterwards.

Mr. Keyser was youngest son of the late Edward Keyser, of Symrna, and Mrs. Keyser, and was 21 years of age.

On August 23rd an inquest was held. Lt. Balden said that Mr. Keyser had been at the depot for four days, and his flying experience was twenty-three hours sixteen minutes. The accident was probably due to inexperience or an error of judgment.

The coroner remarked that accidents were increasing at Hounslow.

Lt. McLean, R.F.C., said that he saw the machine with its nose going down. He believed that Mr. Keyser made an error of judgment, and that the nose was down too much. He was about 2,000 ft. up, and if he had pulled up the machine soon enough he could have righted her.

It was stated that death took place in hospital from fracture of the skull, and the jury found that an accidental nose-dive to the ground was the cause.

LAPERA and SLOANE.—A biplane in charge of Lt. Lapera and Air Mech. Sloane, flying from London to the Kentish Coast, alighted near Westerham on August 22nd, and upon leaving rose to about 600 ft. and then suddenly nose-dived into a meadow, where the machine burst into flames. Both occupants were killed.

MUNRO.—An inquest was held at Hendon on August 21st on Sec. Lt. Guy Horace Munro, R.F.C., who was killed there on August 18th. He was taking a machine from Farnborough, and owing to darkness intended to break his journey at Hendon for the night. He apparently misjudged his distance in landing in the aerodrome and turned his machine to avoid some telegraph wires. The aeroplane having lost speed, nose-dived and crashed. The jury returned a verdict of "Death by misadventure."

Mr. Monro was 24 years of age and lived at Twickenham.

NEALE and HOLLAMBY.—At the inquest at Brentford on August 23rd on the bodies of Capt. John Neale, R.F.C., and Lieut. Douglas Hollamby, R.F.C., who were killed at Hounslow on August 22nd, the evidence showed that they were using a dual control machine, and that Capt. Neale was instructing his companion in its use. The accident was attributed to Mr. Hollamby getting the machine in such a position that Capt. Neale could not pull it out. Had they been higher up, it was stated, it would have been righted. Mr. Hollamby had had only three hours' flying experience, and the machine was new to him.

The coroner expressed surprise that a man with so little experience should have control of a new machine, but added that he supposed that this was the only way to acquire knowledge.

A verdict of "Accidental Death" was returned.

PETTIGREW.—Lt. Gilbert Thomas Richardson Pettigrew, Hereford Regt. and R.F.C., accidentally killed on August 12th while flying in England, was the younger son of the late Mr. William Pettigrew, of Warwick, and of Mrs. Pettigrew, of Hereford. He was born in 1892, and was educated at Warwick School, and became a journalist, afterwards leaving England for Canada to join the Staff of the "Winnipeg Telegram." He also served on the staff of the "Montreal Daily Mail." Subsequently he was appointed private secretary to the Minister of Public Works for Manitoba. He returned to England, enlisted in the Shropshire Light Infantry, and went to the front. Having been seriously wounded at Hooge, he came home, and at the end of 1915 was offered a commission in the Herefordshire Regt.

Shortly afterwards he transferred to the R.F.C., and again went to the front. He returned home at the end of May last after being found permanently unfit for war flying, and acted as an instructor in a training squadron. He was considered an excellent pilot, and was described by his C.O. in France as being "Steady as a rock."

PHIPPS.—Sec. Lt. Christopher Leckonby Phipps, R.G.A., attd. R.F.C., killed on August 14th, aged 20, was the third son of the late Mr. and Mrs. Gerald E. Phipps, of St. Albans. He was educated at Doon House, Westgate-on-Sea, and at Uppingham. He obtained his commission in the Special Reserve in August, 1915, and went to the front the following June. Last May he was transferred to the Kite Balloon Section, R.F.C., and met his death in a parachute descent.

POWELL.—Lt. Patrick John Gordon Powell, R.F.C., was the third son of Mr. and Mrs. Powell, of 18, Tudor Road, Upper Norwood, and was aged 20. He was educated at Cairnburn and Dulwich College, and joined the Public Schools Battalion in September, 1914. Later, however, he went to Sandhurst and received his commission in March, 1915. He served at the front from March, 1916, coming home in July to train for the R.F.C. Having received his pilot's certificate in October, 1916, he returned to the front. He was reported missing on April 2nd, and news has now come that both he and his observer were killed while flying on that date. He was a fine athlete and was very popular.

PURGOLD.—Sec. Lt. Louis E. Purgold, R.F.C., who was killed whilst flying at a home station on August 20th, was the second son of the late Emile Purgold and Mrs. E. Purgold, 3, Alexandra Drive, Sefton Park, Liverpool. He was 21 years of age.

REINCKE.—Capt. Leopold Frederick Reincke, Duke of Wellington's (West Riding) Regt., attached R.F.C., whose death was announced last week, was born in September, 1887, and educated at the Dulwich College Preparatory School and at Dulwich College. In Egypt when war broke out, he came home and obtained a commission in the Duke of Wellington's Regt. After completing his early training he was for many months in this country training troops, but in October, 1916, he went to the front, having in the meantime been promoted to the rank of captain. He took part in some of the later fighting of the Somme offensive, and during this summer he led his company in a great attack. Transferred to the Royal Flying Corps, he returned home, but went to the front again on August 8th, and was killed on the 17th while out on an offensive patrol "far over the enemy lines."

RODGMAN.—Flt. Sgt. Rodgman was killed while flying at Wolvercote, near Oxford, on August 20th. He was at a height of about 100 ft. when smoke was observed issuing from the aeroplane. The machine fell to the ground, blazing furiously. Sgt. Rodgman had flown from Northolt and was on his return journey when the accident happened.

ROWLANDS.—Lt. Arthur William Rowlands, R.F.C., was killed while landing in his machine in Lincolnshire just after midnight on August 15th. He was educated at the Liverpool College, Shaw Street, and graduated at the Liverpool University with the degree of LL.B., first-class honours, a month before the

outbreak of war. On September 12th, 1914, he was articled to Messrs. Bateson, Warr, and Wimshurst, solicitors, Liverpool, and joined the Liverpool Scottish the following month. After serving the first winter in the trenches with his regiment he was granted a commission in the A.S.C. while in France.

He then transferred to the R.F.C., served as an observer for six months, and came over to England, taking his wings in June. He was the only son of Mr. and Mrs. J. W. Rowlands, of 51, Newsham Drive, Liverpool, and was 22 years of age.

SOLLY.—Capt. Arthur Norbury Solly, Manchester Regt. and R.F.C., whose death was announced last week, was educated at Mostyn House, Parkgate, and at Rugby, where he was a scholar and exhibitioner, a member of the O.T.C., and for two years in the running VIII, and at Caius College, Cambridge, where he obtained an exhibition and had been in residence for a year before war was declared, intending to enter the medical profession.

In September, 1914, he returned from Switzerland, joined the Public School Brigade, and was soon promoted sergeant. He received a commission in the Manchester Regt. in October, 1914, and a year later was transferred to the Royal Flying Corps. He was wounded on July 1st, 1916, and in the autumn of that year qualified as pilot.

Since then he had seen much fighting, and was "Lt. C" referred to by the Special Correspondent of the "Times" in his dispatch, published on May 10th, describing how five British aeroplanes fought 27 Germans and beat them, "sending eight to earth crashing, crippled, or in flames." In this fight "Lt. C" saw his crippled comrade slipping downwards and saw the German diving after him. He followed, and before the German could do his work the British aeroplane was almost touching the tail of his machine, and in another second the German turned clean over in the air and then crashed.

Capt. Solly had been promoted Flt. Comdr. and temp. Capt. just a month before his death. His brigade chaplain writes of him as "one of our finest and best, and such a favourite, not only with his own squadron, but with others."

THORNDIKE.—Sec. Lt. Francis Herbert Thorndike, R.F.C., was the son of Canon and Mrs. Thorndike, 75, St. George's Square, S.W. He was educated at the King's School, Rochester, and very early showed strong dramatic and musical ability, appearing as a boy in a number of London plays. In the first month of the war he joined the Westminster Dragoons, and served as a trooper in the Suez fighting of 1914, and later in Gallipoli at Suvla Bay. Invalided home, he took a commission in the Yeomanry, and last spring he transferred to the R.F.C., in which he made very rapid progress, being sent to the front as a pilot only five weeks ago.

WALKER.—Cadet Lionel Reginald Walker, R.F.C. (accidentally killed while flying near Toronto, on or about August 13th), was eldest surviving son of the Rev. Reginald and Lady Emily Walker, of Ragley, Victoria, B.C. He was 18 years of age.

Engagement.

VERNON—BOND.—The marriage arranged between Lt. James Tassie Vernon, R.F.C., son of Mr. Henry Charles Vernon and the late Mrs. Vernon, of Clifton, Bristol, and Edith Muriel Bond, daughter of Mr. and Mrs. Robert Beaumont Bond, of The Red House, Sproughton, Ipswich, will take place at All Saints' Church, Sproughton, on Wednesday, September 12th.

Marriage.

GILMORE—McCOY.—On August 26th, at High Beech Church, Lieut. Eric McCrea Gilmore, Suffolk Regt., attd. Air Board, eldest son of Mr. and Mrs. C. F. Gilmore, of Bayswater, was married to Winifred, daughter of the late Henry McCoy, of Philadelphia, U.S.A., and Mrs. S. Trevor Prince, of Sewardstonebury, by the Rev. C. H. Kempthorne.

Births.

CURTIS.—On August 15th, 1917, at the Grove, Sutton, Ipswich, the wife of Lieut. J. S. Curtis, R.F.C., of a son (still-born).

LUCAS.—On August 18th, at 34, Albert Road, Regent's Park, N.W., to Violet (née Chauncey), wife of the late Lt. A. J. Lucas, R.F.C.—a daughter.

Sir Bryan Leighton, Bt., and Lady Leighton, of Loton Park, Shrewsbury, have received news that their only surviving son, Lt. Richard Tihel Leighton, Yeomanry, attached R.F.C., is missing, his machine having been shot down in an air fight over the German lines on August 17th. The gallant officer was born in 1894, and before joining the R.F.C. had held a lieutenant's commission in the Yeomanry since October, 1914. Major J. B. T. Leighton, Scots Guards, and Squadron Commander, R.F.C., elder son of Sir Bryan and Lady Leighton, was killed while flying in France on May 7th.

* * *

Lt. Hayter, R.F.C., from Farnborough, had a narrow escape of being killed on August 25th. When flying over Plumpton Lane, about five miles from Haywards Heath, his engine suddenly stopped. He was at a height of about 15,000 ft., but he planed down, though at the finish he crashed into a hedge. Several people who saw the accident rushed to the spot and found Mr. Hayter dazed and bleeding from the mouth. He was taken to a cottage close by, where he recovered.

* * *

Lt. Gasson came down in a nose-dive on August 22nd while flying at Southall, and was badly injured. He was conveyed to Hounslow Hospital, and there are only slight hopes of his recovery.

* * *

Major A. N. Miller, D.S.O., R.F.C., is about to leave this country, Reuter's Agency learns, on a second recruiting mission to South Africa. As a result of his last visit 400 recruits were obtained, and these young South Africans have shown such promise in aeronautics that a second visit to South Africa has been decided upon. Major Miller, who will be accompanied by Lieut. Bagshaw, R.F.C., of Port Elizabeth, will take with him two aeroplanes, with which he will tour South Africa in the exercise of his duties, giving exhibitions at various centres.

Major Miller states that he is not limited as to the number of cadets he can obtain. Already over 500 South Africans are engaged in the R.F.C., and both at their work and sports they have in many cases established records. Major Miller hopes to obtain at least 1,000 cadets as a result of his second visit. He is confident of success, as during his last tour he had over 2,000 applicants, although he was only able to nominate 400. Major Miller has not yet definitely fixed the details of his programme, but he expects to be in South Africa at least six months, during which time he intends to show, both in South Africa and Rhodesia, the latest methods of flying.

The conditions for cadets involve absolute medical fitness of the R.F.C. standard and satisfactory educational test, with a minimum of the School Higher Standard.

FRANCE.

Official Communiqués.

August 20th.—Army of the Orient.—The Allied Air Services carried out important bombardments. Fifty aeroplanes dropped 147 tons of explosives in the neighbourhood of Prilep (25 miles north-east of Monastir), causing a large number of fires.

August 21st.—Our aircraft bombarded in Belgium the railway stations of Thourout, Roulers, Stadem, and Gits (north of Roulers), and in the region of Verdun the railway stations of Dun-sur-Meuse, Brieulles, Fléville, and the dump of Bantheville, where a great fire broke out.

Yesterday (August 20th) 21 German machines were brought down by our pilots in air fighting. Most of these machines are reported to have been totally destroyed. On August 19th an enemy aeroplane and captive balloon met with the same fate.

The enemy's aircraft last night bombarded our rear, and in particular a prisoners' collecting camp, where a great number of prisoners were hit.

Army of the Orient.—During the 20th our aircraft were very active. French and British aviators bombarded the quarters occupied by an enemy staff at Prilep.

August 22nd.—Last night German aeroplanes dropped bombs on the district of Gérardmer (about 20 miles east-south-east of Epinal). There were no casualties and no damage was done.

In the course of to-day (August 22nd) six German aeroplanes were destroyed in air fights and five others fell within their own lines damaged.

It is confirmed that two further German aeroplanes were brought down on the 20th by the fire of our machine-guns.

Army of the Orient.—There was great aerial activity by both sides. The Allied aviators successfully bombed the enemy camps and parks in the region of Capari (nine and a half miles west-north-west of Monastir). Three enemy machines were brought down during these operations.

August 23rd.—On August 22nd our squadrons bombarded the railway stations of Freiburg in Breisgau (east of Colmar) and the aviation grounds of Colmar and Schlettstadt (north of Colmar). In the region of Verdun 1,300 kilogrammes (about 13 tons) of projectiles were dropped on the railway stations and bivouacs and aviation grounds of the enemy. Our aircraft also attacked with machine-gun fire transports on the march.

In the region east of Altkirch our artillery caught a German kite-balloon under its fire, and it came down in flames.

Army of the Orient.—Our aircraft dropped bombs on enemy establishments at Razimbey, in the Tcherna Valley.

August 24th.—A German aeroplane was brought down this morning in the Caurières Wood by the fire of our machine-guns. Five other enemy machines fell in their lines after fights with our pilots.

Army of the Orient.—British aircraft bombarded the enemy's establishments near Demirhissar.

August 25th.—Army of the Orient.—British aviators bombed the enemy depots north of Doiran.

August 26th.—Army of the Orient.—The day of the 25th was calm on the whole of the front. Allied aviators bombarded the environs of Demirhissar (Struma front) and enemy camps north of Lake Malik (north of Koritza).

August 27th.—On the 25th and 26th inst. three German aeroplanes and a captive balloon were brought down, and four other machines forced to land out of control in their lines.

The aviation ground of Eix, the hutments of Foameix, the bivouacs of Grémilly and Wavrille (all near Verdun) were copiously bombarded by our squadrons

Army of the Orient.—Our aviators have bombarded Lebnitza, between Lakes Malik and Ochrida.

* * *

Mr. H. Warner Allen, writing in the "Morning Post" from the French front on August 14th, says :—

The remarkable feature of Friday's (August 10th) fighting north-west of Saint Quentin was the important offensive rôle played by aeroplanes in the French counter-attacks. The Germans had succeeded during the night in occupying about five hundred yards of the French advanced line east of the hamlet of Fayet, but despite desperate efforts was quite unable to extend this success.

The French at once set to work to recover the lost ground. Aviators flew very low over the heads of the attacking infantry, and not only kept the gunners informed of the exact position of the troops, but also kept up an unceasing and deadly machine-gun fire on the enemy's trenches. At the moment of the counter-attacks squadrons of aeroplanes hovered over the enemy's positions like hawks, and their fire rendered invaluable aid to the infantry.

The enemy's fire riddled the machines with bullets, but could not damp the ardour of the aviators. After 36 hours' hard fighting the French recovered all the ground they had lost, inflicting severe losses on the Germans.

* * *

Mr. H. Warner Allen, writing in the "Morning Post" on August 21st of the recent fighting around Verdun, says :—

In yesterday's (August 20th) battle the kite-balloons played an important part. In the early morning the Germans sent an aviator, who is regarded as an expert in the destruction of "sausages," to attack two kite-balloons behind the French lines. He was lucky enough to get through the aeroplane patrols, but he missed both balloons. One of the observers shot industriously at the aeroplane as it approached, and then seeing that he could not stop it, threw himself over the side with his parachute. The parachute is so made that the man using it should jump from one side of the car, and in the hurry of the moment the observer jumped from the wrong side. His parachute could not open, but luckily it entangled itself with the cordage of the balloon, thus holding the observer, dangling just below the car. There he had to stay while the German aviator attacked and missed his balloon. When the balloon had been hauled down he was released.

* * *

A message from Paris, dated August 22nd, states that the Special Correspondent of the Havas Agency before Verdun sends the following telegram :—

A fresh crime without any possible excuse has to be added to the record of German Kultur. Yesterday, no doubt, infuriated by their defeats before Verdun, the Germans scientifically bombarded three of our hospitals several times. Towards 10 o'clock in the evening several German aeroplanes flew at a height of less than 200 metres in the district behind Verdun over the clearance hospital No. 6 and another hospital situated on each side of the road and connected by a wooden footbridge. Four incendiary bombs were dropped on the sheds, in which all the beds were occupied by wounded men. Three sheds immediately started blazing, while the medical staff, with admirable courage and devotion, endeavoured to rescue the wounded who had not been struck by projectiles or yet reached by the flames.

The aeroplanes came back a second time, and at a still lower altitude fired with machine-guns on the rescuers. Hospital No. 6 was also struck by bombs. In order to prevent the spreading of the fire the staff hastened to destroy the footbridge joining the two hospitals. The murderous officer aviators, perceiving them, fired on them with their machine-guns. Seven of the staff were killed and about 20 wounded. In the glare of the conflagration the Geneva Red Crosses painted on the roofs of the buildings showed up most plainly in the night, but the German aviators, none the less, continued their criminal work, and came back a third time to bombard the two hospitals.

Seven wounded men were killed in their beds and a dozen others were struck by projectiles. A Red Cross nurse and a male nurse were killed by the bedsides of the wounded. At the time of this brutal outrage the bandaging wards were filled with the wounded. There was no panic, and those of the wounded who were able to get about assisted in the work of rescuing their comrades, while the entire staff made efforts to keep down the flames, which threatened altogether to destroy the wooden buildings.

It was in identical conditions that another hospital at a different point was bombed, and here, too, we have to mourn the loss of victims.

Mr. H. Warner Allen, writing of the fighting round Verdun, in the "Morning Post" on August 26th, says :—

The enemy seems to have adopted the bombardment of hospitals as a deliberate system of revenge In the Verdun district the hospitals of Dugny, Monthairon, Vadelaincourt, and Belrupt have all been bombarded either by guns or aeroplanes. Dugny hospital was attacked on July 14th, July 22nd, and August 3rd. Between August 10th and 18th it was bombarded every day with the exception of the 15th. On the 18th the bombardment was particularly violent. Trenches had been dug round the hospital buildings to afford some shelter against the enemy's projectiles. The chief nurse, Mlle. de Baye, looked after her wounded in the hospital without shelter. She had given her helmet to one of her nurses. A shell burst, killing three women nurses and seriously wounding five, including Mlle. de Baye.

On August 20th an aeroplane attack on the hospital of Vadelaincourt caused 18 deaths and wounded 50 persons. The same night one wounded man was killed by an aeroplane bomb at the Château of Petit Monthairon, used as a hospital, and ten were killed at Belrupt Ambulance. In all, 43 nurses, male and female, and patients have been killed and 55 injured in this region by these treacherous attacks. The Germans are acting deliberately. On an aviator brought down at Mort Homme a photograph was found showing Vadelaincourt hospital with the Red Cross on its roofs plainly visible.

GERMANY.

Official Communiqués.

August 21st.—Twenty-six enemy aviators were shot down. We lost five aeroplanes.

Front of German Crown Prince.—The first day of the battle before Verdun had the same result for the French. The aviators materially assisted in the satisfactory termination of the day.

August 22nd.—During the past few days Lieut. Voss gained his 36th and 37th aerial victory, and Acting-Officer Vice-Sergeant Müller his 25th and 26th.

The bomb attacks of our aviators against fortified towns on the English coast to-day were successful.

August 23rd.—During the aerial attack on the English coast the military establishments at Margate, Ramsgate, and Dover were successfully bombarded. During numerous aerial engagements the enemy lost three aeroplanes. Two of ours have not returned.

August 24th.—On August 23rd (? 21st) one of our airships, while attacking British naval forces, was shot down west of the Jutland coast north of the Horns Reef.—(Signed) Chief of the Admiralty Staff.

In the course of the enemy air attack on the night of August 21st a girl was killed at Metz. No military damage was done at Ensisheim, Freiburg, and Schlettstadt, but a woman and five children were injured.

August 27th.—Baron von Richthofen has shot down his 59th opponent.

* * *

According to a Berlin telegram, a complementary official report respecting the raid by naval airships on the Yorkshire coast on August 22nd gives the following details :—

On approaching the British coast, bombs were lavishly dropped on enemy outpost vessels. The naval forces and land batteries fired briskly at our airships, which replied with well-directed volleys upon Spurn Head battery.

Towards two o'clock in the morning large quantities of explosives were dropped on Hull and good incendiary and destructive effects were observed. The airships also dropped bombs on Lincoln, with observed good effect.

Bombs were dropped on the southern bank of the Humber, near East Grimsby, on brightly illuminated factories and sheds, which were well hit. The collapsing of buildings and the extinguishing of lights showed the effect.

On their return our airships again were fruitlessly fired at from land and sea, and were able to drop their last bombs with good effect on the naval forces which were firing at them.

[It is officially stated that none of His Majesty's ships was damaged.]

* * *

An inspired German report received at Geneva on August 25th from the Friedrichshafen Zeppelin factory states that the recent airship raid on the British coast was entirely intended for observation purposes, and was quite successful.

It is added that the Zeppelin commanders succeeded in ascertaining the strength and position of important British naval forces.

RUSSIA.

Official Communiqués.

August 21st.—Baltic Sea.—On August 19th several squadrons of enemy seaplanes carried out three flights over the coast of the Island of Oesel. In the Gulf of Riga our aviators, meeting the enemy, forced him to retire. An enemy aviator dropped bombs on the town of Arensburg (north of the Gulf of Riga).

Our aviators carried out a flight over the Courland coastline, where they dropped bombs on the enemy military establishments.

August 23rd.—On the Riga coast one of our aeroplanes brought down a German seaplane, which fell into the sea.

August 25th.—To the south of Smorgon our artillery brought down a German aeroplane, which fell in our territory.

August 26th.—Our aviators dropped bombs on several points in the enemy's lines.

August 27th.—On the Danube, on the evening of August 25th, our machine-gun fire brought down an enemy seaplane, which caught fire in the air and fell in enemy territory.

AUSTRIA.

Official Communiqué.

August 26th.—Aerial activity has been exceedingly lively. Assisted by British and French, the Italians are everywhere numerically superior. This superiority is outbalanced by the bold offensive spirit of our fliers. From the 18th to the 23rd 12 enemy machines were shot down, six of them by the chasing squadron of Captain Bromovski, who has disabled already 18 adversaries. During the above-mentioned time we lost one aeroplane.

ITALY.

Official Communiqués.

August 21st.—Two hundred and sixty-one of our aeroplanes have flown on the battlefield. Troops massed between Selo and Comen and on the eastern slopes of Mt. Hermada (all of the Southern Carso) were bombarded; the works at the Tarvis (Carnia, about nine miles north of Tolmino) railway centre and enemy troops in movement there were bombed with five tons of high explosives. One of our chasing machines did not return to its base. One enemy aeroplane was brought down.

Albania.—On August 20th an enemy aeroplane was hit by rifle fire and forced to land within its own lines.

August 22nd.—Masters of the air over the battlefield, our aeroplanes have bombarded troops and hutments in the Chiapovano Valley (12 miles north-east of Gorizia) and along the eastern slopes of Mt. Hermada (Carso), making the enemy suffer losses and causing conflagrations in his communication lines.

August 23rd.—Operations on Julian Front.—The arm of the air also yesterday co-operated in the success. Our aeroplanes and airships have bombarded the enemy, dropping over 12 tons of bombs.

August 24th.—The battle is continuing. On high our aviators, with untiring élan, and giving the enemy no truce, have bombarded his massed troops and carried destruction into his communication lines by dropping 15 tons of bombs.

August 25th.—Aerial activity was very lively yesterday. Our Capronis, after having several times bombed Chiapovano Valley (north-east of Gorizia), crowded with enemy troops, flew low and engaged the infantry. Of the 233 aeroplanes which took part in the battle one only did not return.

August 27th.—Our aeroplanes, by effective and repeated bombardments, sowed destruction in the interior of the enemy lines, increasing the disorder which reigned there on account of the hurried retreat.

* * *

Semi-Official.

August 21st.—During August 19th, co-operating with the advance of the Army, floating batteries of the Italian Royal Navy and British and Italian monitors effectively bombarded the enemy positions and communications on the Lower Isonzo. At nightfall they were attacked fruitlessly by hostile aeroplanes. Enemy seaplane K.212 was brought down by our anti-aircraft guns and captured in the Grado Lagoon (mouth of the Isonzo).

* * *

From the "Morning Post" of August 28th:—

Reuter's Agency has received the following additional details of the fighting on the Italian front from Italian Headquarters:—

An Austrian communiqué of the 25th announces that between 18th-23rd 12 Italian machines were brought down. This figure is absolutely fantastic. The Italian aerial losses in this period of time amount to two machines which have fallen in the enemy lines and two others which were obliged to land outside their proper field, but within the Italian lines. This positive fact, which has been proved, shows what value may be attributed to the Italian losses which the Austrians attribute to them in their communiqué.

* * *

A correspondent of the "Giornale D'Italia," writing of the recent fighting around Korite, says:—

Our aerial fleet is far superior to that of the enemy. A document found on an aviator who had been brought down admitted that the Austrian aeroplanes numbered only one-third of those of the Italians. The feats of our aviators prevented the enemy seeing behind our lines, at the same time throwing into disorder the enemy's rear. At the beginning of the battle our aviators co-operated with the artillery by locating the enemy's first lines and reinforcements and directing its fire. The enemy's losses are extremely heavy, and the number of prisoners is continually increasing.

One of the Stefani communiqués—they have been very frequent of late about aerial things—relates details of the hostile visitation of Venice on the 14th inst., and the reprisal raid of the Italian Naval A.S. on Austrian coast bases and torpedo-boats.

At least four of the enemy's machines were brought down. The crew of one, K.228, are dead, and from another of the raiders brought down on the sea by torpedo-boat fire, a colonel and a major of the Austro-Hungarian Army were made prisoners.

In spite of the repeated mishaps to which the Austrian bomb-droppers are so prone, it is not true that hospitals here are now to be armoured with steel cupolas, nor is it a fact that serious evil-doing is now rewarded by sentences of so many years V.A.D. work.

The poor somewhat naturally show a certain preference for undergoing medical treatment in their own homes.

The United Front has now a United Back as far as this country is concerned. I refer to the home training schools. Almost linguistic academics.—T. S. H.

* * *

A report from Milan states that Capt. Giulio Laureati has broken the world's out-and-home record by flying from Turin to Naples and back without descending. Capt. Laureati, who piloted a new model S.I.A., with a Fiat motor, left Turin at 10.7 a.m., on August 26th, arrived at Naples at 2.30 p.m., and, after circling over that city, returned to Turin, where he arrived at 8.40 p.m.

The distance between Turin and Naples is said to be 460 miles. 10 hrs. 33 mins. for 920 miles is good going.

BELGIUM.

Official Communiqués.

August 21st.—Our aviators, favoured by the weather, have made very many flights. It is confirmed that two enemy aeroplanes have been brought down, one on August 16th at Gheluvelt, and the other on the 18th near Tervaete.

Both yesterday and to-day there has been great activity on the part of German aviators. About 250 flights have been made on each day.

August 26th.—During the past week our aviators have been particularly active. They engaged in several encounters, in which four enemy aeroplanes were brought down near our trenches, and opened machine-gun fire on various occasions against the enemy organisations in the region of Dixmude and Rille, flying over them at a low altitude.

August 27th.—In a period of less than 24 hours Second Lieut. Thieffry was engaged in four aerial engagements, one of which terminated to his advantage, the enemy machine attacked by him having fallen in flames to the north-east of Mannekensvere. This makes the ninth machine brought down by this officer.

HOLLAND.

A message from The Hague on August 25th states that an official communication by the Ministry of Foreign Affairs states that the Dutch Government has protested to Berlin against the flying over Dutch territory on August 8th by a squadron of German aeroplanes and the dropping of bombs without military necessity.

The German Government, through its Minister there, has expressed its regret. It states that the German squadron in the English Channel lost its bearings owing to thick clouds, and leaving the clouds found itself over Dutch territory, so that, owing to a strong south-westerly wind, it inevitably had to fly over the province of Zeeland.

The Dutch Government charged its Minister in Berlin to inform the German Government that the latter's explanation of the facts did not justify the flying over the province of Zeeland, nor the flight over the provinces of Friesland and Groningen by two aeroplanes, of which one descended near Blyham, and the second was shot down near Beetra.

At the same time the Dutch Ministers in London, Le Havre, and Paris were charged to ask the Governments to which they were accredited if the aeroplanes of their air fleets, by participation in an air fight over the island of Schouwen, were culpable of the violation of Dutch territory and the dropping of bombs. In the meantime the military authorities are making an examination of portions of bombs.

* * *

A message from Amsterdam states that bombs have again been dropped on Dutch territory. On August 25th some fell near the village of Cadzand and others this morning near the village of Aardenburg. Only very slight damage was caused.

* * *

A German one-seater aeroplane landed on August 23rd near Elburg, on the Zuyder Zee, in the province of Gelderland. The pilot, an officer, has been interned and the machine seized.

SWEDEN.

The well-known Swedish aviator, Captain Dahlbeck, has made proposals for a seaplane service for passengers and mails between Stockholm and Abo, Finland. The journey by land now takes three days and three nights; by a seaplane service it will take but a few hours.

R.F.C. UNIFORMS.

So much doubt exists about the uniform properly to be worn by officers of the R.F.C. and officers attached R.F.C., that it seems well to quote Dress Regulations concerning the Corps.

Army Order 378, 1913, which lays down the law on the question, begins with the following reference to the much-debated question as to whether the much-disliked R.F.C. tunic is to be worn by officers of the Army attached R.F.C. :—

ROYAL FLYING CORPS.

579A.—Officers seconded in their regiments for duty with the Royal Flying Corps wear the full dress, undress, and mess-dress of their permanent unit.

[Here is a very knotty point which should be decided once and for all. The order that attached, or seconded, officers are to wear the R.F.C. tunic was issued as what is commonly known as a "War Office Letter." One is told, by those who ought to know, that a War Office instruction of this nature cannot cancel or override an Army Order, which has the direct authority of the King. Therefore, until a new Army Order is issued on the subject it would seem that the instruction for all officers below field rank to wear the unsightly double-breasted tunic is null and void.

Naturally, one does not recommend young officers who are proud of their own regiments, and the tradition attaching to their regimental badges, to refuse to obey an order from their C.O.'s to wear the R.F.C. tunic, but one does strongly recommend senior R.F.C. officers to find out whether they are acting in accordance with King's Regulations in ordering their subordinates to discard the uniform of their permanent units.—C. G. G.]

FULL DRESS.

579B.—HEAD-DRESS.—Forage cap (universal pattern), para. 21. Blue cloth with scarlet band and welts. Badge in gilt, the letters "R.F.C." in monogram within a laurel wreath, surmounted by a crown.

579C.—TUNIC.—Blue cloth, with scarlet collar and cuffs. The collar ornamented with $\frac{5}{8}$-in. blue braid along the top and ends and blue Russia braid at the bottom; the cuffs pointed with $\frac{5}{8}$-in. blue braid round the top, the points of the cuffs 6 in. from the bottom of the sleeves. Eight buttons down the front and two at the waist behind. The skirts cut square in front and closed behind; ornamented with three loops of blue Russia braid embroidery on each skirt behind. The front and collar edged with scarlet cloth. Twisted, round, gold shoulder-cords lined with blue cloth and fastened with small buttons.

579D.—BUTTONS.—Gilt, almost flat, with letters "R.F.C." and crown.

579E.—COLLAR BADGES.—As for cap badge, but smaller.

579F.—GIRDLE.—Blue silk, $2\frac{1}{2}$ in. wide, lined with black morocco leather and fastened at the left side with three loops and three small gold embroidered olivets.

579G.—TROUSERS.—Blue cloth, with scarlet cloth stripe, 2 in. wide, down the side seams.

579H.—BOOTS.—As described in para. 16 for dismounted officers.

579I.—GREAT COAT.—Drab, of special pattern, with bone buttons, and badges of rank in worsted embroidery on the shoulder-straps.

SERVICE DRESS.

579K.—CAP.—Austrian pattern, of drab serge, with brown leather chin-strap. Badge as for forage cap, but in bronze.

579L.—JACKET.—Drab serge, of special pattern, worn with white strip linen collar. Badges of rank in worsted embroidery on the shoulder-straps. No collar badges.

579M.—BREECHES.—Bedford cord, of special pattern.

579N.—BOOTS.—Brown ankle, para. 16.

579O.—PUTTEES.—Drab, para. 40.

MESS DRESS.

579P.—MESS JACKET.—Blue cloth, scarlet cloth roll collar; pointed cuffs of scarlet cloth, 6 in. deep at the point and $2\frac{3}{4}$ in. deep behind; four small buttons and button-holes down the front. Shoulder-straps of blue cloth, $1\frac{1}{2}$ in. wide at the base, tapering to about 1 in. at the points; rounded points, fastening with a small button. The shoulder-straps sewn in at the shoulder. Collar badges as on tunic.

579Q.—MESS VEST.—Blue cloth, fastened with four small buttons.

579R.—BUTTONS.—Gilt, flat, engraved with the letters "R.F.C." and a crown.

579S.—OVERALLS.—As in full dress.

579T.—BOOTS.—Wellington. Field officers, box spurs.

579U.—SPECIAL BADGE.—A "flying" badge is authorised for officers possessing certain qualifications. It is worn on the left breast above medals and decorations, in gilt for full dress, undress, and mess dress; in silk embroidery on blue cloth for service dress. For the mess dress the badge is smaller.

579V.—WORKING CLOTHING.—Of the pattern supplied for non-commissioned officers and men.

579W.—Officers of the Royal Flying Corps, Special Reserve, are required to provide only service dress, mess dress, and the necessary working clothing. The provision of full dress is at the option of the individual except when posted for continuous service.

"ALL THE WORLD'S AIRCRAFT."

The 1917 edition of "All the World's Aircraft," the companion volume to Jane's "All the World's Fighting Ships," has now been placed on the market by the publishers, Sampson Low, Marston and Co., Ltd. As the editor and compiler thereof, I suppose I had better review it myself, seeing that I cannot decently let someone else praise it in THE AEROPLANE, and I am certainly not going to let anyone else damn it in this paper.

To begin with, the publishers insist on selling the book at a guinea, though I did my best to persuade them to put the price up of 25s., seeing that everybody is charging more for everything—except authors and editors, apparently—and the partners in "All the World's Aircraft" certainly deserve a war bonus as much as anybody else. However, the net result is that purchasers of this monumental work get just twice as much for their money as they did last year, so far as quantity is concerned. I leave the buyers to judge the quality for themselves.

Naturally it has been impossible to publish photographs or figures about the more recent of the Allies' machines, especially English machines. The French and Italians are rather less secretive about their fairly recent types than are our own people. But, anyhow, in compiling the book, I was careful not to include anything which we did not already know to be known to the enemy. On this point the Naval and Military Censorship appears to have agreed with me to quite a remarkable extent, for it paid me the compliment of passing the whole work without altering or deleting a word or an illustration anywhere. For which courtesy I hereby express my thanks.

This fact, however, must not be taken as implying that the information is out of date. The book is a work of reference and not a newspaper, so it is practically as up to date as any work of reference can be, under the circumstances. At any rate, it includes among enemy machines the D.III. Albatros, the Gotha, and the Roland, and so far we have heard of few newer types.

A dictionary of aeronautical, technical and slang terms has been added this year, because so many new and important people are beginning to take an interest in flying, and will have to learn a new language before they can understand the subject. Slang words, though most reprehensible in use, must necessarily be understood by such people, hence their inclusion. For their benefit also, tables are included showing the growth of various records for speed, height, duration, and distance, step by step, since flying began. In no way can one appreciate so well the progress flying made in the six brief years before the war.

The aeroplane section of the book is introduced by a long and very able article on "War Flying" by Captain W. E. de B. Whittaker, the King's Regiment, whose knowledgable writing was a prominent feature in THE AEROPLANE before the war. During the war, Captain Whittaker has seen a great deal of active service, and has himself flown discomfortably over enemy fire, so that he writes with experience to guide him. The airship section, which is, of necessity, chiefly historical, is largely composed of an article by Mr. W. L. Wade, who has studied the history of airships to good purpose. The aero-engine section has a lengthy preface by Mr. de Holden-Stone, written so as to be understanded of the people.

The historical section has been largely expanded, in accordance with the desires of reviewers of earlier editions, and I was so fortunate as to obtain from the Countess of Drogheda permission to use in the prefatory notes those excellent historical notes on war balloons and parachutes which that talented lady herself wrote for the catalogue of her Aeronautical History Exhibition. So far as I can gather no such brief and comprehensive history of these two precursory branches of modern aeronautics have ever been published, and I wish here to express once more my indebtedness to Lady Drogheda for her permission to use her work.

It is my desire to make the work under discussion a kind of aeronautical encyclopœdia, so I shall be greatly obliged to any readers of this paper who may also read "All the World's Aircraft," if they will in due course write and give me any suggestions which may occur to them for the improvement of future editions.—C. G. G.

["All the World's Aircraft" can be obtained, price 22s., post free, from the William Dawson Publishing Co., Ltd., 2, Bream's Buildings, E.C.4.]

THE WORLD'S AIR ROUTES.

Those who heard the excellent lecture given recently on The World's Air Routes by Colonel the Lord Montagu of Beaulieu, C.S.I., F.R. Met. Soc., A.I.M.E., will doubtless appreciate the highly educative effect that lecture would have had if it could have been heard by many thousands of people. Consequently one is glad to learn that it can now be bought in pamphlet form.

Nearly all the lantern slides shown at the lecture, which were of the highest interest, have been incorporated in the book, which is very well printed by Eyre and Spottiswoode. It is published by the Car Publishing Co., of Regent House, Kingsway, W.C., at the low price of 6d., or 8d. post free. One hopes that many readers of this paper will avail themselves of this opportunity of educating their friends in the possibilities of aerial transport.

THE INVASIONS OF ENGLAND.

An inquest on six victims of the recent raid was held on August 23rd, at the hospital at Ramsgate. Walter Spain, one of the deceased, was just about to commence a new job at the harbour when the raid took place.

A man named Coomber was about 30 ft. under the road in a storehouse. It was explained that he must have felt the full force of the rush of air following the explosion. A witness said that three of the men who were lying inside the storehouse were almost unrecognisable.

The Chief Inspector of Police said that nearly 30 bombs were dropped by the raiders. They appeared greatly worried by our gunners, whose shooting was splendid.

The Deputy Mayor said the raid served no military purpose, and did not assist the German campaign. It was difficult to believe that in these days of civilisation and Christianity such things could be done, and he hoped God would forgive the authors, for our people never could.

[It would seem sufficiently obvious that the military objective was the harbour and stores to which reference was made in evidence.—Ed.]

* * *

The Press Bureau announced on August 23rd that the total number of casualties in the aeroplane raid on Ramsgate and Dover on the previous day was :—

Killed	11
Injured	26

* * *

A correspondent of the "Daily Telegraph," writing on August 22nd, says :—

The raiding Zeppelin reported by Lord French as having attacked the mouth of the Humber appeared over one locality about half-past twelve, and was given a very hot reception. It was a beautifully clear night, and the raider was flying at a great height. It was nevertheless caught in the rays of the searchlights, and for a time was clearly visible to those below, and formed a distinct though distant target for the anti-aircraft gunners.

British aeroplanes were in pursuit, but the sky becoming overcast, and the raider having dodged the electric rays, made good his escape. For nearly an hour the Zeppelin was confined to a particular area, thanks to the activity of our defences, but its great altitude spoiled them of their prey. Several bombs were dropped, but for the most part they fell in open country, doing very little damage.

* * *

At 7 a.m. on August 27th the funeral took place at Margate of the three German aviators who were brought down in a burning Gotha aeroplane last week. The bodies, which were badly charred and which had been lying at the farm on which the machine fell, were conveyed to the grave on a gun-carriage. Officers and men of the Royal Naval Air Service attended, and the military provided an escort and a firing party. The burial service of the Church of England was read by a military chaplain, and afterwards three volleys were fired and the Last Post sounded. There were no name plates on the coffins

* * *

At an inquest at Ramsgate the jury recommended the provision of public bomb shelters was urgently necessary, and that the cost should be met by the Government. The Deputy-Major, in expressing the town's sympathy with the parents, said that he had called a council meeting for this week to consider the suggestion. He thought that ultimately the cost should fall on the Government, but human lives were in the balance, and expense must not be allowed to affect their decision.

AIRCRAFT IN THE HOUSE.

On August 21st **Major Baird** (**Parliamentary Secretary to the Air Board**), in reply to **Colonel Burn** (U., Torquay), said generous contributions to the cost of the provision of aircraft had been received from all parts of the Empire, and from British subjects in neutral and Allied countries. The total number of gift aeroplanes or seaplanes so provided since the beginning of the war was 437. These gifts were much appreciated by His Majesty's Government and by the two Air Services as evidence of public interest in their work.

CONGRATULATIONS.

MARTIN.—On August 21st, at Lingwood, St. George's Hills, Weybridge, the wife of Helmuth Paul Martin, of a daughter.

SPENCER'S SPORTS.

On Saturday, August 18th, the male employees of Messrs. C. G. Spencer and Sons, Ltd., the balloon manufacturers and aeronautical engineers, of Highbury, Clapton and Hackney, held their annual outing, brakes conveying them to the Old Rye House. On arrival, they immediately proceeded to do justice to a very good dinner, provided by the host, Mr. Ernest Allen, managing director of the company.

Mr. Allen congratulated the rigging staff on the good work they had done during the war, and suggested that, despite what unfair critics might say, each man had the consolation that he was doing something for his country in the present critical moment, and it was very possible that the important work of aircraft construction was as essential to victory as an army in the field.

He informed the employees that the firm had a very large number of important contracts in hand, and trusted that the very high quality of workmanship would be maintained, and the output would continue to increase, and that any demands made upon them by the Government would always receive the very greatest attention, from the heads of the firm down to the youngest member of the staff.

The following were the results of the ensuing sports :—

Tug-of-War.—Manor Works beat Highbury Grove.

75 Yards Race for Veterans.—1, Preskett (Manor Works); 2, Gates (Highbury Grove); 3, Hiscox (Manor Works); consolation, Bean (Manor Works).

75 Yards Race for Men—31 to 55.—1, Linfoot (Manor Works); 2, Rose (Manor Works); 3, Archer (Manor Works).

200 Yards Race for Men under 30.—1, Sheppard (Manor Works); 2, Durrant (Highbury Grove); 3, Allgood (Highbury Grove).

TRADE CARDS.

MISCELLANEOUS ADVERTISEMENTS.

AIRCRAFT PARTS.

Hardwood for Aeroplanes.—Specially Selected air-dried timber as supplied to leading constructors in Britain and the Continent. Silver Spruce, Ash, Poplar; Hickory and Ash Skids; Threeply; Thin Cedar and Mahogany for Floats; Walnut for Propellers.—William Mallinson and Sons, Ltd., Hackney Road, 'Phone, 3854 Central, 4770 Wall.

Small Parts.—We can turn out small parts of almost any description, wood or metal. Press stampings, iron, brass or aluminium. Tell us what you want and we will do our best.—The All-British Manufacturing Co., 149, Farringdon Road, E.C. (Contractors to H.M.G.)

Tapes, Webs, Cords and Threads in all qualities, suitable for Aircraft Work. Delivery from stock.—John MacLennan and Co., 30, Newgate Street, London, E.C.1. (See Advertisement Page 623 and Buyers' Guide.)

Aeroplane Seats. We can give quick delivery of cane seats, A.G.S. 264 or other patterns, guaranteed pass inspection. Write us for anything required in cane work.—The Willowbrook Company, Leicester.

Delaunay Belleville Automobiles (England), Ltd. are in a position to quote for supplying machine parts in quantities. Specialities:—turning wood, grinding, milling, drilling, acetylene welding. Work must be first-class priority. Preference given to aeronautical or equally important requirements. Quotations given on receipt of blue prints.

Aeroplane Parts.—Advertiser wishes to invest capital and take personal interest in a business manufacturing parts under Government contracts.—Particulars in confidence to Box No. 2051, The Aeroplane, 166, Piccadilly, W.1.

WANTED.

Metal Work, welding, etc., wanted by firm with up-to-date plant; skilled staff; prompt and personal attention.—Shephard, 528, Kingsland Road, E.8. Phone, Dalston 3404.

Wanted, mahogany, teak, and walnut cuttings from builders', railway, and aircraft works.—Box No. 2001, The Aeroplane, 166, Piccadilly, W.1.

(*Continued on page* 632.)

All Advertisements for the Miscellaneous Advertisement Columns MUST arrive at this office by first post on Saturday.

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Special PREPAID Rate: 18 words 1/6; Situations Wanted ONLY, 18 words 1/-; 1d. per word after.

For the convenience of Advertisers, replies can be received at the office of "THE AEROPLANE," 166, Piccadilly, W.

PATENTS.

PAGE & ROWLINGSON, Chartered Patent Agents (Consulting Engineer, Mr. S. E. Page, A.M.Inst.C.E.), 27, Chancery Lane, London, W.C. Tel. 332 Central.

Henry Skerrett, Chartered Patent Agent, 24, Temple Row, Birmingham.—Patents, trade marks, and designs.

Inventors advised free. Write for booklet.—King's Patent Agency, Ltd., 165, Queen Victoria Street, London. 30 years' references.

Stanley, Popplewell and Co., Patent Agents and Consulting Engineers. Applications for Patents attended to in all countries.—38, Chancery Lane, W.C. Telephone: 1763 Central. Circular free.

FINANCE.

Advertiser, ex-service pilot with workshop experience desires active interest in aircraft firm engaged on Government contracts. Could find some capital for sound concern. Box No. 2030, THE AEROPLANE, 166, Piccadilly, W.1.

SITUATIONS VACANT.

Aeroplane Wing-making and doping; experienced workers wanted. Those on Government work or living more than 10 miles distant need not apply. Call 10 to 12, and 2.30 to 4.—Sage and Co., Ltd., 58, Gray's Inn Road, W.C.1.

Practical Manager wanted for Propeller and spares department; unique opportunity for competent man. State salary, references and previous experience. No one on Government work need apply.—Applications must be made through nearest Employment Exchange, mentioning this paper and Box No. 2042.

Required immediately, one or two aeronautical draughtsmen for experimental work. First-class men only need apply. Good wages and permanent work for the right men. S.W. London. No one already on Government work or residing more than 10 miles away need apply.—Box No. 2048, THE AEROPLANE, 166, Piccadilly, W.1.

Foreman required immediately for erection shop: must be good disciplinarian, tactful and used to handling men. Also two capable charge-hands. No one already on Government work will be engaged.—Apply giving age, experience and salary required to your nearest Employment Exchange, mentioning this paper and Box No. 2029.

Milling-shop Foreman; exceptional opportunity for a man thoroughly conversant with the best class work, including the manufacture of aircraft engine connecting-rods. Permanency to suitable man, who will be in a position to earn good salary. No one already on Government work eligible.—Apply at your nearest Employment Exchange, quoting reference No. A3592.

SITUATIONS WANTED.

Aero Engine Manufacturer (Works or General Manager) is open to consider offer from progressive firm. Capable organiser and specialist in:—(1) Heat-treatment of Alloy Steels; (2) Plant Lay-out; (3) the Design of Tool Equipment; (4) Mass production of interchangeable components; (5) Rotary Engine manufacture. Good production record.—Box No. 2043, THE AEROPLANE, 166, Piccadilly, W.1.

Tool-room Foreman or works superintendent, aircraft work, desires re-engagement. Well up in aircraft requirements, stampings, jigs, tools, engines, etc.—Box No. 2007, THE AEROPLANE, 166, Piccadilly, W.1.

Saw-mill Foreman (now disengaged) desires responsible position. Practical all-round woodworking machinist. Used to up-to-date methods on production of aeroplane components and ammunition cases.—Apply Box No. 2056, THE AEROPLANE, 166, Piccadilly, W.1.

Assistant Works Manager or production man seeks position. Eighteen years' practical experience in motor and aero and general engineering.—Apply Box No. 2054, THE AEROPLANE, 166, Piccadilly, W.1.

Youth, 17, smart, well-educated, seeks situation in aero-engine firm. Some knowledge of internal combustion engines and drawing. Not afraid of hard work.—Apply Box No. 2053, THE AEROPLANE, 166, Piccadilly, W.1.

Designer in well-known firm, responsible for one of the most successful machines of the war, engaged on aircraft design and construction during the last 8½ years, R.A.C. aviator's certificate, good organiser, is shortly free to undertake responsible similar position in good firm. Kindly communicate in first instance with "A," Rahscher's Hotel, 55, Manchester Square, W.

Chief Storekeeper.—10 years motor and coach trades. 3 years' aircraft manufacture (aero-engine and plane components). First-class experience.—Box 2049, THE AEROPLANE, 166, Piccadilly, W.1.

Experienced Mechanical Draughtsman desires position with aircraft firm. Good workshop and technical experience. Well up in drawing office routine.—Apply Box No. 2052, THE AEROPLANE, 166, Piccadilly, W.1.

Wanted by experienced electrician in aircraft or munition factory for maintenance and take charge of entire electrical plant.—Box No. 2050, THE AEROPLANE, 166, Piccadilly, W.1.

Splicer required for steel cables (aeroplane erection). First-class workman essential. No one already engaged on Government work or resident more than 10 miles away will be engaged.—Apply personally or by letter to Works Manager, Handley Page, Ltd., Kingsbury Works, Edgware Road, Hendon, N.W.

As Foreman. Covering and doping, thoroughly practical. Energetic.—Apply Box No. 2055, THE AEROPLANE, 166, Piccadilly, W.1.

FOR SALE.

Aeroplane Radiators.—The Gallay Radiator Company, Limited, stock Aeroplane Radiators. For the benefit of Constructors, can supply radiators for experimental purposes at a nominal cost. Advice given on suitable types for the various approved engines. Our drawing office is always at our clients' disposal.—198, Great Portland Street, London, W.1.

Three Sets Instruments, Government type, comprising Revolution counter, altitude Meter and Speed Indicator by S. Smith and Sons. £15 per set.—Apply, Smith, Aerodrome, Bournemouth.

Tarpaulins for Sale.—Good second-hand railway truck sheets repaired and redressed, London Works.—Write for prices, Johnston, 12 Broughton Road, Croydon.

ENGINEERING.

British School of Aeronautics. — Aircraft Engineering Course; Aero Design; Aero Construction; Aero Draughtsmanship; Mechanical Engineering. — Pennington's, 254, Oxford Road, Manchester.

FACTORY FOR SALE.
GROUND AREA, TWO ACRES.

A MODERN WATERSIDE FACTORY Just off the Mile End Road. Containing 50,000 square feet of floor space, to be sold with or without the steam motive power. Full particulars of

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ON PROGRAMMES AND PRODUCTION.

In order to place quantity production on a practical basis it is necessary to have a programme, whether it be for a Service or a mere commercial purpose. For instance, in the case of the Flying Services it is necessary to lay down a regular scheme for the production of certain machines and engines during a certain period. Knowing approximately—only a rough approximation, one fears—how many of each can be produced in a given time, and the factories available for their production, the programme has to set forth the types and numbers of each type to be made during the period covered by the programme, and the factories in which each type is to be reproduced.

Now it is fairly obvious that any departure during the allotted period from the programme laid down must result in upsetting the arrangements made for quantity production in the various factories. Washing out one type and substituting another must cause delay in deliveries. Alterations in detail design, alterations in specifications of material, or the substitution of one engine for another must also cause delay. To secure maximum output it is necessary to lay down a programme and stick to it rigidly.

On the other hand, if the programme covers too long a period, it will mean that the machines produced towards the end of that period will be already out of date when delivered, owing to the rapid improvements which are constantly being made in design. And the more rigidly designs are standardised the more pronounced will be the contrast between the performances of the last machines of one programme and the first machines of the next. If slight modifications are permitted in machines of the same type in the same programme, then probably the last deliveries will be better than the first, and will approximate fairly closely to the first batch of the next programme.

Rigid versus Elastic Programmes.

To take a case in point, the original F.E.2b—now obsolete—had a third pilot-wheel to the under-carriage and the necessary struts and bracing to carry it. Also it had a 120-h.p. Beardmore engine. Supposing that it had belonged to a rigidly fixed programme which could not be modified, it would have continued as such to the end of that programme without modification. It was, in fact, modified and improved by substituting a 160-h.p. Beardmore and simplifying the under-carriage by abolishing the third wheel and all its tackle—which modifications did not necessitate any material alteration in the standardised parts of the machine, and so did not hold up deliveries.

In those distant days I do not suppose that anybody had ever heard of programmes, but the instance will serve to demonstrate the difference between a rigid and an elastic programme, so far as detail design and easily made modifications are concerned. In this instance the modification and improvement became possible because the 160 Beardmore came into being after the F.E.2b had been standardised with the 120. In other words, the output programme of the Beardmore works happened to overlap and not to coincide with the F.E.2b programme of the Royal Aircraft Factory, though probably the arrangements for output were not officially called programmes.

For all I know, the F.E.2b may have been designed for a prospective 160 Beardmore, or another engine altogether, but what actually did happen will serve to illustrate the point as concerns rigid versus elastic programmes.

Impossible Synchronisation.

There is another point in connection with fixed programmes which deserves consideration. A certain number of firms which have shown in the past their ability to produce original designs of definite value, and others which can show cause why permission should be given to them, are permitted to build experimental machines. Now, in a perfectly ordered and organised world, all those experimental machines would be ready for official test on a certain date, and the pick of them would then be selected for inclusion and standardisation in the next official programme.

Unfortunately, it is much more likely that slight errors in design or construction, or even defects in a propeller or an engine, for which the design of the machine is not to blame, may prevent the best machine of the lot from doing its best performance before the new programme is fixed, and so it must necessarily be left out of that programme. And then, just when all the sources of production are in full blast on the new programme, that slightly delayed machine may come along and put up a performance which puts the programme machines utterly in the shade.

Yet if that machine is promptly substituted in the programme for those just adopted, it is going to hold up deliveries of the quite good machines already in process of manufacture, and is going to keep the pilots at the front on the obsolescent machines of the previous programme.

If I am not altogether misinformed, something very like such a position exists at the moment in two well-known firms. In each case the firm is busily at work on officially designed machines which have quite decent performances—albeit they might be produced much more quickly if redesigned in detail. In each case the firm itself has produced a machine which performs very much better than the official type, and is said to be very much simpler and quicker to make.

But if those firms were permitted to side-track the work they are now doing, and to start in to make their own machines, it would cause a transition period during which their deliveries would drop badly. And even

when their own machines began to come through in quantities they would be non-standard, and would upset any programme laid down for the allotment of new machines to certain squadrons at the front and the equipment of those squadrons with the necessary spare parts for the machines allocated to them.

A Difficult Problem.

It is evidently a difficult problem to decide how best to deal with machines or engines which just miss one programme and are too early for the next. Refusing to use them at all means depriving the people at the front of machines which are obviously better than anything they are likely to have for a long time. Using them means delaying standardised machines.

One solution would be to turn them over to be made by the Royal Aircraft Factory, under the supervision of their original designer. Upsetting of commercial standardisation and of plans for quantity production would not affect the R.A.F., which exists primarily as an experimental establishment, and for the production of spares. These machines might be turned out there by the dozen instead of by the hundred, and used by self-contained detached squadrons, so that their equipment of spares would not worry aircraft parks and depôts at the front. Thus the machines would do good work, and experience gained in using them might lead to improvements which would make them worth including in the next programme. If, before the new programme came along, some other designer had beaten them badly, that would be merely the fortune of war and commerce, and they would be washed out along with the old programme. At any rate, the machines would have fulfilled a useful purpose, which would be much better than holding them up entirely till the next programme was being fixed.

Overlapping Programmes.

Naturally all these problems are affected by the length of time covered by each programme. For instance, a programme covering a whole year would be obviously absurd, for improvements, and even great discoveries, follow one another so rapidly that by the end of a year everything with which a programme started would be hopelessly out of date, despite modifications in design such as have been indicated earlier in these notes. One has only to look at any year-old design to see the truth of the statement. The fact that we are using in quantities designs which are two and even three years old is a national misfortune, not a disproof of the argument.

The shorter the programme the more quickly can new or radically altered designs be put into use. And yet the programme must be long enough to permit of organisation for quantity production on a big scale, otherwise constant chopping and changing from one programme to another would be as bad as having no programme at all. I will not venture to lay down a proper length for a programme, but it certainly does seem fairly evident that no one type of machine can last out more than six months on active service and still be considered up to date.

One is inclined to wonder, therefore, whether it would not be possible to institute a system of overlapping programmes. The Aircraft Industry might be cut up into definite sections, each with its own allotted programme, so that by the time the programme for one section was about half-way through, another programme for another section would be just starting deliveries. The Aircraft Industry is now such a huge affair, and is growing so rapidly, that each such section might easily be bigger in a few months' time than the whole Industry was a few months ago. Under such a system each section would begin its programme two or three months after the preceding section, and so there would be a constant supply of the newest and most up-to-date machines such as Sir Douglas Haig demanded some nine months ago as a necessity for the maintenance of the mastery in the air.

Objections and Answers.

It is true that the overlapping of programmes in this way would mean that there would be many different types in use at the front at the same time, but that could hardly matter, so long as each section of the Industry was told off to supply certain R.F.C. brigades and so long as the aircraft parks of those brigades were supplied with the necessary spares by that particular section of the Industry. It would mean that certain brigades would at certain moments be better mounted than others, but each in turn would have new supplies from its own new programme. Which, after all, would be better than keeping a few veteran squadrons on obsolete machines and sending out new and inexperienced pilots on the newest and very best types which they were incapable of handling to the best advantage. There are doubtless plenty of other objections and difficulties in the way, but at any rate there may be the germ of an improved system in the suggestion, which I offer in all humility.

That Confounded Pendulum.

There must be some way out of the chief trouble connected with fixed programmes, namely that while machines from a new programme are just being put into service the R.F.C. will be better mounted than the enemy, and that while the tail end of the programme is being delivered the enemy will be in the ascendant. It is all very well to talk airily about "the swing of the pendulum," as politicians do when they want to excuse a series of heavy losses due to the superior equipment of the enemy from time to time. The real task of the Air Board, and especially of its technical department, is to get that confounded pendulum up to our end of its swing and keep it there.

ON SOME LESSONS FROM THE ENEMY.

One way of defeating an enemy is to profit by the lessons he teaches. The German has always been singularly clever in learning lessons of this kind. For years before the war he defeated us by taking our new ideas, adapting their design for quantity production, organising his factories for big and rapid output, and then flooding the markets of the world with goods which we originated but could not produce at his price.

In war he has been not less willing to learn, even if he has been less successful in the result of his lessons in some ways. In other ways he has been highly successful, and has improved on our originals. For instance, he distinctly cribbed his Fokker monoplanes from the Morane, his scout biplanes from the Sopwith and Bristol designs, and his two-seaters from the Avro. Whence he stole his Gothas I do not profess to know, but certainly our multiple-engined Shorts were long before any German effort with multiple engines, and the Dyott twin-engined machine, designed in 1914, built in spite of official disinclination in 1915, and flown successfully in 1916, when the design was well over a year old, was as near as no matter exactly according to the best modern practice, albeit hopelessly underpowered, again thanks to official disbelief at the time.

Wherever the German has improved on our originals it has been in performance and not in workmanship or detail design, and he has always had the advantage of having magnificent engines, whereas—again thanks to previous obtuseness—we are only just beginning to have engines. Thanks to his engines, he has been able to put up very fine performances, and in the success of those performances he has learned other things which seem worth studying.

The Spread of Education.

There are heaps of points to "crab" about German machines, but it would be a very silly thing to do it in print, for one does not want to help the Hun to improve his machines by the light of our criticism—"our" being that of such officers and men of the Flying Services and people in the Aircraft Industry as have had the rare privilege of inspecting captured German aeroplanes. The word rare is used, not because captures are rare, but because, contrary to French custom, few are privileged to penetrate to the Holy of Holies in which our official experts stow away the prizes which they acquire by the prowess of the mere fighting man. It is curious how much trouble and expense is incurred in educating young officers in technical aeronautics before they learn to fly, and how carelessly the expansion of their technical knowledge at the expense of the enemy is treated afterwards: or, perhaps one should say, has been.

It would be well if one could point out all the bad things in German aeroplanes, just to show our own designers what to avoid, but it would be better still if one could describe all their good points, so as to help to improve our designs.

In a general way the commonest reproach against German machines is rough interior finish. As a matter of fact, that is really a good point, so long as it is not so rough as to increase weight. Sand-papering and polishing internal woodwork and cleaning up internal or external metal-work cannot possibly save any weight worth mentioning, so presumably the time so spent is wasted, because it might be used in producing something useful.

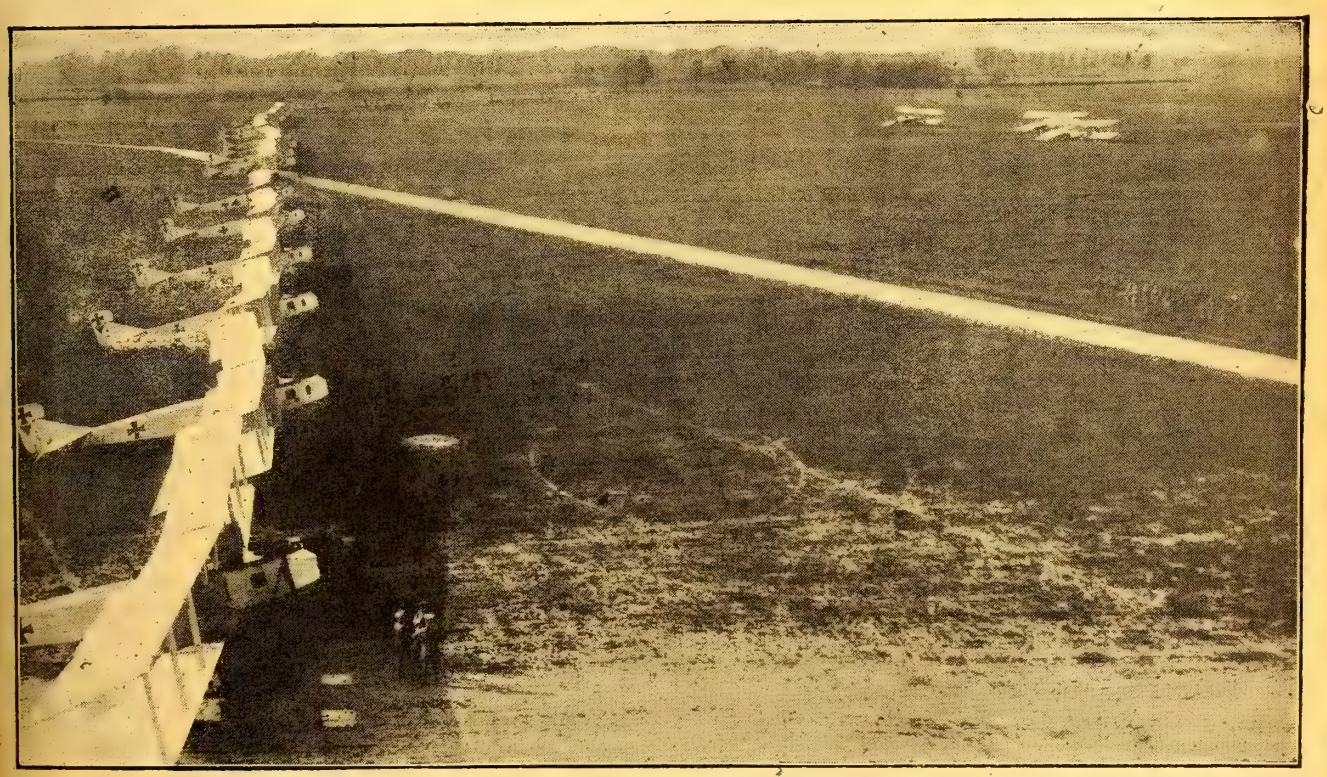
Breakage in the Air.

There is, however, a terrible amount of shockingly bad work in German machines—according to our ideas of what is good. Nevertheless, they seem to hang together somehow, and it is doubtful whether the number of German machines which break in the air is greater in proportion than the number of ours which do likewise.

In this connection there is, however, one very important point to note. In most types of ours which break, the breakage seems to be traceable to extreme lightness, which lightness is due to our endeavours to procure with relatively low-powered engines the same performance which the Germans procure by simply cramming in more power. One gathers from contemporary German technical publications that our light construction horrifies the German at least as much as his rough and ready construction horrifies us.

When one tries to get a better climb with an 80-h.p. Rhône than the Hun gets with a 160-h.p. Mercédès something has to be cut down to permit it. Similarly when one uses a problematic 120-h.p. R.A.F. on a two-seater to do that for which the Hun uses a 200-h.p. or a 260-h.p. Mércèdes or Benz on an Albatros or D.F.W. one must not be surprised at wing-spars collapsing if, to reduce weight and head resistance, only a single pair of struts is used. The German having so much more power at his disposal has less excuse for breakage, so when his machine breaks he must be blamed for bad work or bad material or bad design, and cannot put in the necessities of war as an excuse.

Naturally we are to blame for using feeble engines, but that is entirely the fault of those officials who discouraged British engine design before the war, and standardised too soon on bad engines, which only became reasonably reliable after they had already become out of date. However, we are improving.



THE ENEMY'S BEST.—A Squadron of Gothas on a German Aerodrome. About 15 machines appear on the left, about nine more head on in the far background, and three more in the open.

Examples Worth Following.

Where the German really scores is in his common sense in over-all design. A look at any modern German tractor biplane convinces anyone whose eye for general effect is not blinded by a maze of figures that the German "walfisch," or whale, shape is obviously right.

Take the little D.III type Albatros chaser, or the Albatros two-seater, or the D.F.W.-Aviatik, and one may see that from the front of the propeller-pot to the tip of the tail the whole thing looks right. The pot fades away into the engine-housing. The engine-housing fades off into the rounded top and bottom and the somewhat flatter sides of the fuselage. The fuselage likewise fades off into the tail and fin. And the whole affair gives one the impression that it is one single job and not a patchwork of afterthoughts like all our officially designed machines and some of our trade designs.

All the curves blend together, or sweep from one to the other harmoniously, like Wagnerian music in which everything means something and yet all is a perfect whole, whereas some of our stuff, the B.E. and R.E. series in particular, is like American ragtime with bits of airs put together anyhow, with jarring edges sticking out all over it. It is simply imperfect mathematics *versus* art all over again. Our officials seem to forget that the ultimately perfect mechanism is always supremely eyeable. We do not know enough about the science of aeronautics to rely upon our mathematics yet, and that is why the machine built largely by eye always beats the machine built entirely by figures.

Power Preservation.

Notice another thing. The wily Hun does not put his air-screw flat up against a great radiator, or a huge cowl, so that the propeller tips have to do all the work while the major portion does nothing except waste power in turning round. He carries his propeller out on a long nose to the engine, so that the point at which the natural line of the fuselage runs into it is only a few inches from the centre. Thus the propeller-pot is quite small and all the part of the blade which is worth using is used. The line of the fuselage slopes back so gently that the slip from the inner portion of the propeller blade is not thrown violently outwards, but has a fair lead along the fuselage.

In some machines the tops of the cylinders stick out above the top of the fuselage, but even so they are well away from the propeller, and anyhow, being so narrow, they do not put up as much resistance as would a cowl close up to the propeller. In other machines even the little projecting cylinder-heads are covered with a special streamlined cowl of their own.

German Propeller Design.

So far as one can judge from photographs, the Germans seem to have learned a good deal about propeller design, for the part of their propellers immediately emerging from the pot seems to have a very peculiar shape, as if it were intended to have some particular effect of its own in relation to the air streams over the pot and the nose of the fuselage. Anyhow, it has a hump on it which is not in the least like the inner sections of our pseudo-scientifically designed four-bladers.

Moreover, it may be noticed that although the German engines are more powerful than ours the Germans never use a four-bladed propeller. They seem to be able to mop up all their huge power with two short blades, and to do it efficiently, whereas we use four blades, do not get any better results, take at least twice as much labour and time to make the propellers, and use at least eight times as much precious timber in making them. The German is not a fool where the combination of manufacturing and science is concerned, whatever else he may be in other ways, and I do not think he uses two-bladers of those funny shapes just for fun or even for economy, so I take it that he knows what he is at.

German Scientific Ways.

Before the war, certain of our own designers who have since made good in practice, and so have made one inclined to trust their theory, used to think very highly of a certain haunt of Hun highbrows known as the University of Göttingen. One may reasonably suppose that the aeronautical laboratory and testing and experimental plant at Göttingen has improved during the war, seeing that the Germans rely so much on practical science in all their manufacturing work and are not satisfied with mere scientific fireworks, or gasworks, as we have always been.

Therefore one might reasonably suppose that the University of Göttingen is, proportionately to the size of the German Aircraft Industry, as far ahead of our official stipendiary geniuses to-day as it was before the war. Which, when one considers the relative sizes of the German and the British Aircraft Industries, may mean quite a long way ahead, seeing that the Germans have to turn out enough machines to hold their own against the united products of Great Britain, France, America, Russia, and part of Italy, the rest of Italy about balancing Austria's output.

Anyhow, even if the increase has not been in such proportion, a good many of us would back Göttingen for sense and science combined against the National Physical Laboratory and Company, judging purely by results. So it may be just as well, when one is permitted the privilege of inspecting a German aeroplane, to try to puzzle out why the Hun designs certain things in certain ways, instead of merely scoffing at the obviously bad workmanship, as appears to be the custom of some of our people.

Fabric.

Another matter on which we might perchance learn something from the Hun concerns fabric. I am told that the wing covering of the modern German machines resembles sacking rather than aero-fabric as we understand it. One's obvious inclination is to argue from this that Germany is short of flax or short of spinning machinery or short of weaving machinery or short of spinners and weavers. Which, of course, would be very consoling, just as the great Mr. Belloc's calculations about the shortage of German man-power were consoling, till it began to appear that the prophesied shortage did not come to pass.

Therefore it is better to look for another reason for the sacking. I suggest that it may be used on purpose, in preference to the kind of stuff we use.

In the first place, it would appear to be a good deal cheaper to make. Which means that it costs less in time and labour. Fewer hands can produce more of it, with less wear and tear of machinery and less expenditure of fuel, lubricants and other things which are precious in a belligerent country.

In the second place it may be preferable in other ways. It would appear to be a good deal stronger, for example. Our intelligent technicians lay down a law that fabric must not weigh more than so many ounces per square yard. They insist on all sorts of interesting tests for bursting strains, tensile strains, and so forth:

all of which may be fulfilled by a very fine fabric, whereas probably what matters most in fabric on war machines is its resistance to pure tearing stress, which is quite different from tensile or bursting stresses.

Tearing Strength.

Doubtless you know that old trick of tearing a number of cards at once. If you keep them all together they cannot be torn, because you try to shear the whole lot at once. But if you slide them skilfully into the position of a flight of steps, so to speak, they can be torn quite easily, because you tear the first and then the second and then the third and so on, so that the progress of the tear, or shear, in each card is always one step ahead of that in the card next to it. Well, the real strength of fabric is something like that.

If the stress comes on the whole lot together, either as a bursting stress from the air, or as a tensile pull from the working of the wing structure, the strength may be more than sufficient. But if a hole is made in the wing by a shell splinter so that a tear is started and a piece is left flapping in the wind, the pull may come entirely on one thread, and then on the next, and then on the next, so that one after another the threads break and the whole wing covering rips off.

Now suppose that in two sorts of fabric an equal number of linen threads per square inch were woven together, so that the weight per square inch (or per square yard) was exactly the same, only in one case each three consecutive threads were twisted into a kind of rope, whereas in the other they were laid side by side, then obviously the first kind would be a coarse open fabric and the other would be a fine close fabric. On a straight pull they would presumably be of equal —or nearly equal—strength, because in a band, say, a foot wide there would be an equal number of threads in tension. But if one tried an edgewise tear in the coarse fabric, instead of having to break one thread only, to start the tear, one would have to break three at a time, and so on for each successive thread, so presumably that fabric would be three times as hard to tear as the finer kind.

One has heard so much of fatal, and nearly fatal, accidents lately through fabric tearing off the wings of high-speed machines that the question of using a fabric which is coarser but more resistant to tearing may be worth considering. There is, naturally, the objection of its greater porosity, but it is not clear why this should be an objection, seeing that greater porosity would make it easier for the dope to penetrate. And if dope as at present constituted is not suitable, then it may be possible to alter the dope to suit. Perhaps coarser fabric might permit of using a thicker dope which could be applied more quickly and in fewer coats.

Fabric Possibilities.

So far, everyone seems to have been hunting for finer and lighter fabric, and as people have a habit of thinking like sheep, especially in new sciences or industries where nobody really knows anything for certain, perhaps it may be worth somebody's while to turn round and start thinking the other way altogether. Perhaps the Germans know a lot more than we do about it after all. Remember, they have command of the whole Belgian flax supply, so they cannot well be short of material. Also, there may be other fabrics altogether preferable to flax, if somebody had the gumption to get out of the rut and go and look for them. We only took to linen because it was the obviously next thing to cotton, when we found that cotton was damaged by dope. The Irish linen trade was thus forced to take an interest in aviation, and so evolved what was wanted for the time being. But the textile industry as a whole has not taken an interest in the game, so we do not yet know what improvement on cotton or linen could be evolved if some experienced textile man really tried.

At the present moment I happen to be watching developments concerning some quite interesting substitutes for linen fabric, which, if they pan out all right, will come in at something like half the present price, and will be right outside the control of the people who appear to have mixed up so successfully the prices and supplies of linen fabric.

And, after all, perhaps all fabric covering for wings is entirely wrong. Probably they ought to be made on an entirely different principle.

Fuselage Making.

Perhaps the most important departure the Germans have made from all other countries in aeroplane design is their consistent use of ply-wood for fuselage covering. The first person to realise the possibilities of ply-wood was the inimitable M. Béchéreau, of the Deperdussin Company. The little racing Dep of the 1913 Gordon-Bennett race, the first machine to cover 120 miles in an hour, was a true *monocoque*, or single hull, machine with a fuselage built entirely of layers of thin wood cemented in strips onto one another, and built up on a mould the shape of the fuselage, an expensive but most effective method of construction.

The system was adopted and improved by Mr. Koolhoven, in those extraordinarily enduring machines which he built for the British Deperdussin Company with Lieut. John Porte, R.N., in 1913.

No other firm took to the principle, on account of the expense probably, till well on in the war the Germans started using ordinary three-ply wood and bending it over a frame made up of ribs and stringers like the hull of a ship, attaching it thereto with nails. This is not as neat a job as the Deperdussin way, but it certainly seems better than the ordinary longeron, cross-strut, wire-bracing, and fabric method.

Wrong and Right Fuselage.

If one longeron is shot through, probably the whole fuselage crumples up. If a longeron is cracked in a bad landing, it is not seen, and the whole tail probably falls off the next time the pilot tries to spin. Fabric covering may get shot about and be torn by the wind, so that it wraps itself round the controls. A bullet may cut a couple of bracing wires and let the whole fuselage twist out of controllable shape.

On the other hand, with the three-ply monocoque any fracture which can do any harm is at once visible outside. It can be shot as full of holes as a sieve without being any the worse for it. It cannot tear under any circumstances. Over half its circumference would have to be shot away by a shell before it could break across, and more than three-quarters might be shot away in a series of small holes without having any serious effect. If badly shot about, it can be repaired quite easily from the inside, or patched with fabric on the outside. It is stiffer than any possible longeron and wire fuselage.

In fact, everything is in favour of the three-ply monocoque, and nothing is against it except its cost and its weight, both of which could be reduced if its manufacture were tackled as a commercial proposition on a quantity production basis. Probably it could be made cheaper than the longeron type if tackled as a kind of McGruer Spar problem.

A Pioneer Type.

Probably by now most people have forgotten that experimental Bleriot monoplane produced in the first few months of war, which ought to have been the pioneer of all quantity production types, and perhaps still may

be. The forepart, as far back as the passenger's seat, was all of metal, a kind of bath of bullet-proof steel in which sat the engine, tanks, and crew. Bolted onto the back of that was a three-ply truncated cone, for the barrel of the fuselage, and on the chopped-off end of it was bolted the tail, fin, elevator, and rudder, as a complete unit.

The bullet-proof bath spoiled it, on account of the weight, but the general idea of building up fuselages in three separate units, with a three-ply monocoque centre section, was perfectly sound. I wonder who will have the enterprise to start on something of the sort as a standardised, quantity production, programme job.

Thank the Hun.

Anyhow, let us thank the Hun for a good many useful lessons of late. He has taught us how to use and run multiple-engined bombing squadrons. Several young and ardent R.N.A.S. officers knew as much and more about it a year or two ago, only it needed the Hun to convince our authorities as usual.

He has taught us how to use and run "circus" squadrons, although "all star" fighting squadrons were quite a favourite notion with some of my young friends in the R.F.C. long enough before anyone ever heard of Immelmann or Bölcke or von Richthofen.

He has taught us the uses of big high-powered engines, though every aero-engine designer, except the official experts who were trying to make the 90-h.p. R.A.F., knew a year before the war that they would be wanted.

He has taught us quite a lot of other things which quite a lot of people in this country who were not official experts knew long enough before the Hun knew them, though they could not use their knowledge because they were not officially approved.

For example, there is nothing new in all this stuff about streamlines, and propellers, and fabric, and three-ply, and monocoques, and so forth. It is all as old as the war, and older, to plenty of people in the Aircraft Industry. Only the Hun has done it, or used it, or made it, and has got it all working successfully to his own advantage, and we have not.

And in these days so many of our leading Service and official experts are young gentlemen who have never heard of Lilienthal, and Chanute, and Phillips, and Weiss, and Etrich, and other people who have really done things, that it is well worth while to dig up ancient history once in a while under the guise of discussing novelties. So thanks to the Hun for affording the opportunity. I hope we may profit by it.

C. G. G.

CAPTURED MACHINES.

From the "Daily Express":—

The official "Norddeutsche Allgemeine Zeitung" prints the following list of British aeroplanes which, as alleged, fell into German hands during the month of July. The names and numbers are as they appear in the German text:—

47 Sopwiths.—One-seaters.—No. 7493: Lt. Fitzherbert, 55 Sqdn., dead. Motor Clerget, 9B 2674: occupant burned. No. A.6240: Capt. Hudson, a prisoner. No. 6332: Lt. Grosset, a prisoner. No. unknown: Lt. Steldon. No. B.2779: Lt. Wordmann, wounded. No. B.3806: Capt.-Lt. Voight, dead. No. unknown: Lt. Shepherd, dead. No. 3528: Lt. Tapp, wounded. No. unknown: Lt. Whyte, a prisoner. No. A.6216: Sec. Lt. James B. Hine, a prisoner. No. unknown: Lt. Smith, dead. No. unknown: Lt. Ellis Breid, dead No. 3823: N.C.O. Hume, a prisoner. No. B.3531: occupant dead. In five Sopwith one-seaters the names of occupants and numbers could not be identified.

Two-seaters.—No. A.3: occupants unknown. No. 2133/7484: occupants taken prisoners. No. unknown: Pilot unidentifiable; Observer Sgt. Eric Fletcher, both burned. No. unknown: Lt. G. G. Mathew, a prisoner; Lt. E. D. Sliter, wounded. No. A.7490/6547: Sec. Lt. V. C. Coombs Taylor, Sec. Lt. Harold Montagu, both wounded. No. S.8/1665: Lt. George Gordon, Capt. MacLennan, both dead. No. R.2576: Capt. G. H. Cook, Lt. Moore, both prisoners. No. A.1020: Sgt. W. S. Wikham, Lt. H. N. Curtis, both dead. In six Sopwith two-seaters neither the numbers nor names of the occupants could be ascertained.

Triplanes.—One-seaters:—No. 5435 Lt. Hillabi, dead. No. 6309: Lt. Millward, dead. No. 5480. Lt. Ramsay, dead. No. 6291: Lt. Eyre, dead. Motor Clerget No. 1658: Lt. Ramsay, dead. No. 6304: Lt. Kent, a prisoner. No. C.A.5368: Lt. C. R. Pegler, dead. Motor Clerget, No. R.1236: J. C. May, dead. No. 5452: Lt. George Valentin Austen, wounded. No. N.5492: occupant, dead. In three triplanes neither the numbers nor the names of the occupants could be ascertained.

12 Nieuports.—One-seaters:—No. 3764: Lt. A. R. Adam, dead. No. 3544: occupant unknown. No. B.3483: occupants unknown. No. 3358/6783: Lt. Davis Godfrey, 40 Sqdn., a prisoner. No. B.1678: J. R. Campbell, dead. No. B.1575: Sec. Lt. G. A. H. Perques, 60 Sqdn., wounded. No. B.1694: Lt. F. W. Rook, 40 Sqdn., dead. Motor le Rhône: Sec. Lt. W. A. Bond, dead. In four Nieuport one-seaters neither the numbers nor names of the occupants could be ascertained.

5 B.E.—One-seaters:—Motor Beardmore, No. 838: Lt. C. M. de Rochie, dead.

Two-seaters.—No. 22329: both occupants dead. No. A.7109: both occupants dead. No. 23858: both occupants dead. No. A.7448: pilot dead, observer wounded.

5 de Haviland Scouts.—No. A.7449: Sgt. Walkers, N.C.O. Harris, prisoners. No unknown: Sec. Lt. A. P. Matheson, both occupants dead. In three de H. Scouts neither the numbers nor the names of the occupants could be identified.

4 Spad.—One-seaters:—No. A.6633: Lt. Douglas Weld, 19 Sqdn., a prisoner. No. S.1541: Capt. Jean Lamon, wounded. In two Spads neither the names of occupants nor the numbers could be identified.

3 Martinsyde.—One-seaters:—No. 1572: Sec. Lt. G. H. Palmer, 27 Sqdn., a prisoner. Motor Clerget, No. 2795: occupant burned. No. A.3986: Capt. H. B. Wilkins, wounded.

3 F.E.—One-seater:—No. 4937: Capt. MacGown, 25 Sqdn., wounded.

Two-seaters.—No. unknown: Lt. Grafters, Machine-Gunner Bachhouse, 20 Sqdn., both dead. Motor Rolls-Royce, No. 2275/5: Lt. Charles Hayers Balden, Lt. William Harog Watt, 20 Sqdn., wounded.

2 S.E.—One-seaters:—Motor Wolseley, No. 700/2233: occupant burned. Motor Wolseley, No. D.8355: occupant dead.

1 Rumpf D.D.—The names of occupants and number could not be identified.

1 Aeroplane.—No. 5523: Occupant dead.

A MATTER OF DISCIPLINE.

At the Westminster court-martial on August 28th, Lt. Henry Rogers South, R.F.C., pleaded guilty to conduct to the prejudice of good order and discipline in that he at Kensington on May 8th borrowed £30 from Sec. Air Mech. Duller, R.F.C., a private soldier in the unit in which he was serving.

Lord Cheylesmore, the president, read the summary of evidence, in which Duller stated that at the accused's request he gave him a cheque for £30. Accused gave him an I.O.U., and the money had not yet been repaid.

Major Stoner said he had always found accused a gentleman whose character was all that could be desired. He had had a motor-cycle accident which had affected his health and nervous system.

On accused's behalf it was said he was worried about financial affairs over which he had no control. In his desperation he went to this man. He had rendered good service at Farnborough.

The Court's decision will be promulgated in due course.

ESCAPED PRISONERS.

The German aviators, Lt. Orbum von Scholtz and Lt. Josef Flink, who escaped a few days ago from the Holyport Prisoners' Camp, Maidenhead, were recaptured at Beckenham, on August 28th.

INVASIONS OF ENGLAND.

The Local Government Board is asking local authorities to provide temporary shelters for persons rendered homeless by air raids. Hammersmith Council has already arranged for the use of premises in cases of emergency.

A QUESTION OF PRIORITY.

A mechanic employed by a firm engaged on the construction of standard ships applied to the London Munitions Tribunals on August 31st for a leaving certificate. He said he wanted to obtain employment under the Aid Board, which he considered was work of greater national importance.

The Chairman: But standard ships are of great importance to us.

Applicant: Yes, but airships will be more important still.

The application was refused.

THE DURATION OF THE WAR.

BY ROGER BAYONS.

(The first article of this series appeared on March 3rd, 1915, and the second and third on December 13th and 20th, 1916, respectively.)

Since the last articles of this series appeared in these pages the conditions of the war have changed considerably in many ways. In December last the territories of Roumania, with the exception of an insignificant portion in the south-east, had fallen into German hands. The British and French progress on the Western front had stopped for the winter months. The United States of America, directed by a statesman of singular ability and foresight, was still negotiating with the Central Empires in the hope that reason would prevail in the German camp, and that the coercive diplomacy of Prussia would realise the stupidity of alienating the last powerful neutral from a friendship which, if a little one-sided, was at least a valuable relief in the general antagonism prevailing against the Kaiser and his legions.

Minor nations, such as Chili and Peru, beloved of the society poets, still held their hands awaiting an opportunity for interference which would justify their action. Nations which, by reason of their minute armies and navies, are unable to take a prominent offensive part in the war are still valuable as neutrals. They can be the homes of propaganda, and from their shores important wireless messages as to weather conditions and movements of shipping can be sent to the enemy, isolated as he is by the sea blockade. Each nation, therefore, which declares war is injuring the Germanic allies to a degree out of all proportion to the additional manpower employed.

The Enemy at a Standstill.

Another feature of the past few months has been the loss of the power of taking the offensive on the part of the Central Empires. In December last, though the enemy was stationary, or even in a process of gradual retreat, the initiative had not been lost on other fronts. In Russia, success on occasion followed the Emperor's eagles, in Roumania the enemy was uniformly victorious, and on the Italian front he was in an impregnable position.

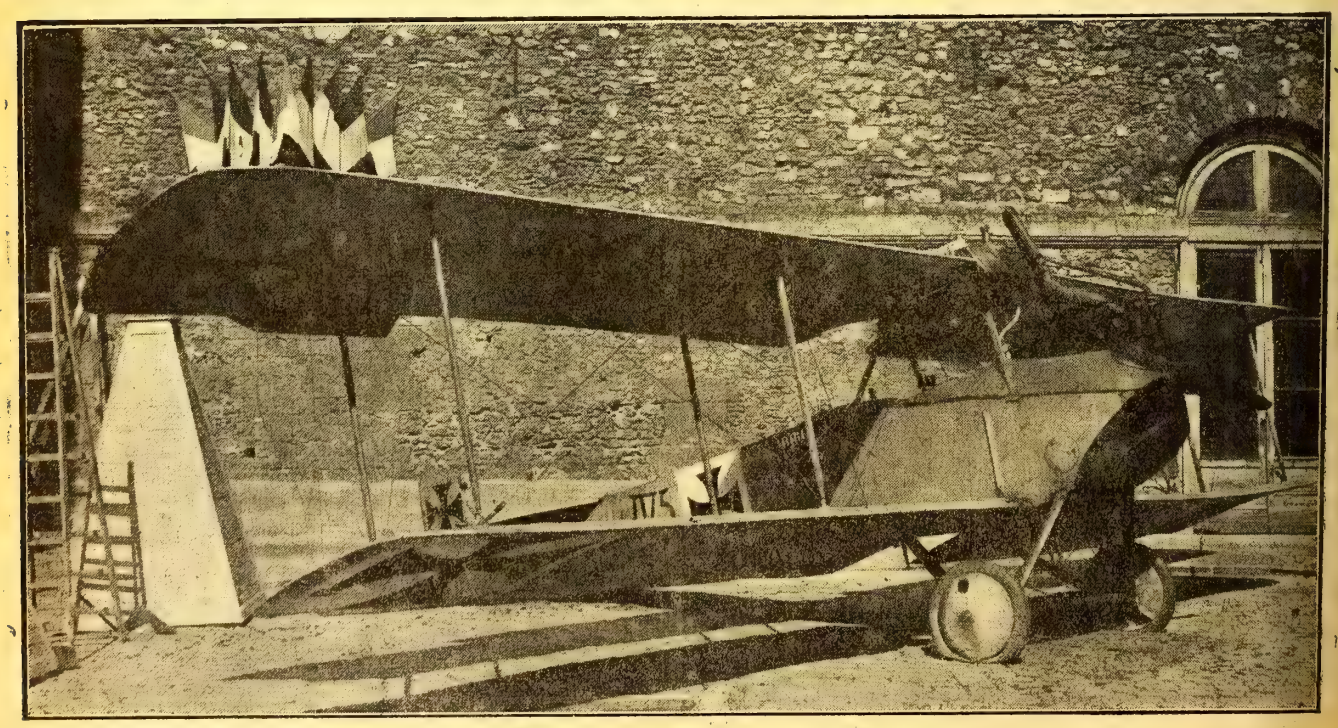
To-day no light illumines the sky of his military future, save that he may attain an advantage of unknown dimensions in Russia. On all other fronts he is slowly but surely being ousted from those positions which he has spent so much blood and money to obtain and maintain.

At sea he is denied any hope of such victory as would alter his fortunes in the war. He is inflicting heavy damage on the shipping of the Allies, but the damage is not irreparable, and the loss of cargoes involved causes no more than an unpleasant shortage in the countries concerned. Great Britain cannot be starved into submission by such means as are at present in use by the Germans, nor can her Allies suffer seriously.

In the air he is steadily losing any title to supremacy. The machines of the Allies are improving, and the supplies are increasing at rates which the Central Empires cannot hope to rival. The Germans are able to make air raids on England which are in a manner effective in that damage is inflicted and that the public are disturbed from their attitude of detachment from the troubles of war. But in no way can such limited success bring him nearer a decisive victory in Flanders, and every aeroplane he detaches for raiding purposes reduces his aerial strength in the principal arena of the war. In consequence, his troops must fight in blindness against a foe whose eyes are day by day becoming keener and of greater penetration.

British Pugnacity.

The great ones of his flying services have gone, and there is none to take their place. The unnamed British pilots who fly as a matter of daily routine are attaining a degree of success which at one time in the history of the present war would have given them a personal fame in all nations of the world. Hostile formations of aircraft advancing in all the majesty of numbers are en



A Modern L.V.G. Biplane, captured by the French. The curious cut-away ailerons are noteworthy.

gaged without hesitation by small parties of British aviators in such a manner as to deny the enemy the objective at which they aim, even though in the effort the epitaph of our pilots is contained in the words ". . . machines did not return."

Infantry are attacked from a height of a hundred feet when marching in the fancied security of that mysterious region "behind the lines." Columns of supply are daily thrown into hopeless confusion as they endeavour to carry out the routine of essential duty.

Enemy aerodromes on which live the pilots whose duty it is to harass the hated British or French are raided by our pilots in such manner as seriously to reduce the daily happiness of the enemy flying personnel. Nothing is sacred from the attacks of the Allied squadrons save those enemy towns which are happily situated at distances too great from our lines for successful flight.

Unity Is Strength.

But all this does not mean that the Germans are beaten. These varied disadvantages merely indicate that with unity of purpose and a continuity of effort the Entente Powers will be able ultimately to impress their will upon the enemy. Disunion or vacillation would give immediate and complete victory to the enemy, and it is only these two common failings of the Anglo-Saxon race on which he is placing his hopes.

The entry of the United States of America into the war cannot but be a serious blow to the Germanic Empires. It cannot bring about an immediate change in the present state of affairs. That country was less prepared even than was Great Britain in August, 1914, and time is necessary before the full weight of American intervention can be felt in Europe. But a limit is placed on the time in which it might be possible for the Central Empires to achieve either a victory in the field or in diplomacy. All their efforts must be thrown into the next few months. Next year will be too late. Therefore we and our Allies must see that no possibility of military or political advantage is left to the enemy in the immediate future.

Not only will the United States provide us with a vast increase in man-power, in matériel, and in food, but her entry into the war will effectually cut off all supplies from the American Continent to Germany.

Two things dominate the present state of the war—man-power and matériel. If it be granted that all other things be equal, and that in military genius the Central Empires are not greatly superior to ourselves and our Allies, an overwhelming surplus in trained men and in the munitions of war with which they fight is a certain guarantee of ultimate success.

The Advantage of Preparedness.

The Central Empires must at last be suffering from a great shortage of personnel. In earlier days his losses were more than counterbalanced by the losses of the Allies, for the enemy possessed a vastly greater number of men trained or partly trained than did the Entente Powers. Germany and her Allies had a greater percentage of returnable casualties than her enemies, and her people from earliest childhood are and have been for generations nurtured in the rudimentary principles of the art of war. The nation as a whole understood its duties during a period of hostilities. Mobilisation was carried through in entire orderliness, and such of the manhood of the land as were not in the striking force began intensive training that when their time of warlike service came they would not be found wanting.

There was no need in Germany to devise a "Service Army." The cadres were already in existence and could be expanded with the ease and simplicity of a well-designed machine. And the expansion of her armies has increased almost continuously up to the present time.

But the conditions have changed. The Central Empires have no new sources of personnel save the later classes of young boys whose days of service would not normally be due for another two or even three years. And these classes are all a little war-worn. Under the present conditions of war the entire populace suffers from its rigours to an appreciable degree, and in the Germanic Empires the people must have lost that vivid enthusiasm for combat which is proper to all healthy races.

On the other hand, her enemies have vast resources of fresh personnel. The United States, Portugal, and some of those minor States whose names have a magic charm, and are their only recommendation, all provide new drafts of men not yet disillusioned as to the horrors and difficulties of war. In sheer ignorance, if for no better reason, they will fight with vigour and address. Whatever their losses or whatever their success, they will at least kill Germans, which is an essential part of the present war.

(To be continued.)

A WORD OF ADVICE.

A reader of The Aeroplane has received the following letter from a friend on the eve of his appearance before the Selection Committee, which interviews candidates for commissions in the R.N.A.S. He suggests that the reproduction of the advice contained therein may be of assistance to other youths about to undergo a similar ordeal:—

Dearest Old Thing,

On the eve of the supreme and awful crisis of your life, a few words of advice from an old friend and true may find a genuine welcome. I therefore take the liberty, sir, of setting forth the following points, which should, in my humble opinion, prove of some use to one in your predicament.

(1.) The Board will in all probability consist of oldish men, who may have seen as much of the world and its contents as you have yourself. Treat them not as verdant babes. They will not like it or you, if you do, and if they do not like you, you will not get through. Which would be a pity considering your special ability with all kinds of machinery.

(2.) Do not show any signs of fear. They might argue that a man who was afraid of a Board would be terrified at the sight of an aeroplane, a machine in the construction of which boards play such an important part.

On the other hand, do not treat the Board with complete indifference, nor yet smile at them in a kind yet pitying way when answering their questions, after the manner of a rural divine telling the children of his parish the date of the Sunday School treat. Your attitude should be one of fearless determination, yet paying the Board that reverence which is due to men who have seen service.

(3.) Wear your black and white striped tie, unless you can get another which looks more like a "colours" tie. But I do not think you can.

When they ask of your prowess at games, enlarge with pardonable pride upon your boating, and look meaningly upon your tie. But make it quite clear that your day-boy colours are quite different to the tie you wear. No direct deception, you understand, is necessary.

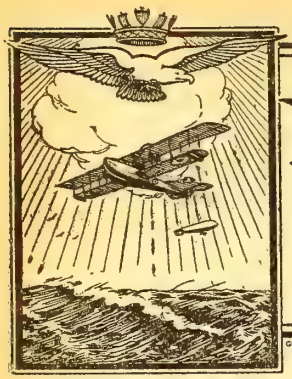
(4.) I offer this piece of advice in all seriousness and sincerity. Have your hair cut just a little shorter than usual, especially at the back. Get it well brushed, without too much grease. Its appearance should be "well-groomed" rather than "well-oiled."

(5.) Carry gloves and a stick, and, I think, wear your straw-hat with the school band. You look much better in this than in a cap, either "school" or "blood." I do not remember seeing you in any other kind, so that I cannot advise fully upon this point.

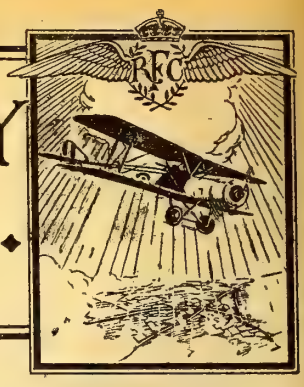
(6.) Go to bed early the night before so that you do not go before the Board with black eyes; this makes you look very wreckish.

(7.) Finally, try to hit off the clean-limbed, etc., public-school boy rather than the wealthy and gay under-grad.

Yours, etc.



NAVAL and MILITARY AERONAUTICS



FROM THE "LONDON GAZETTE."

Admiralty, August 26th.

August 30th.—R.N.A.S.—Temp. Act, Flt. Lt. Alfred W. Jones, D.S.C., specially promoted to temp. Flt. Lt. for meritorious service in the field, August 28th, 1917.

War Office, August 28th.

REGULAR FORCES.—General Staff.—Attached to Headquarter Units.—Brigade Comdr.—Capt. (temp. Lt.-Col.) C. G. Hoare, Indian Cavalry, from a Wing Comdr., and to be temp. Brig.-Gen. whilst so empld., Aug. 1st, 1917.

Establishments.—R.F.C.—Mil. Wing.—Staff Officers, 1st. Cl. (Graded as an A.A.G.).—Capt. (temp. Lt.-Col.) D. L. Allen, R. Ir. Fus., from a Wing Comdr., and to retain his temp. rank whilst so empld., Aug. 1st. 2nd Cl. (Graded as a Brig. Maj.).—Temp. Sec. Lt. (temp. Maj.) J. Rubie, D. Gds., from a spec. appt. (graded as a Park Comdr.), to relinquish his temp. rank and to be temp. Capt. whilst so empld., Aug. 1st. 3rd Cl. (Graded as a Staff Capt.).—Temp. Lt. J. M. Mitchell, Gen. List, from an Equipment Officer, 2nd Cl., and to be temp. Capt. whilst so employed, Aug. 1st.

Adjt.—Temp. Lt. G. H. L. Sweet, North'd Fus., from an Equipment Officer, 3rd Cl., and to be temp. Capt. (without the pay or allowances of that rank) whilst so empld., July 27th.

War Office, August 29th.

REGULAR FORCES—Establishments—R.F.C.—Mil. Wing.—Flt. Comdrs.—Sec. Lt. (temp. Lt.) A. Gray, Arg. and Suth'd Highrs., T.F., from a Flying Officer, and to be temp. Capt. whilst so empld., August 7th. From Flying Officers:—Capt. G. S. Buck, Lond. R., T.F.; temp. Sec. Lt. A. I. Riley, Gen. List, and to be temp. Capt. whilst so empld., August 10th. Lt. S. T. Ravenscroft, Yeo., T.F., and to be temp. Capt. whilst so empld., August 14th.

Spec. Appt.—(Graded as an Equipment Officer, 2nd Cl.)—Temp Capt. R. F. Wills, Gen. List, from an Equipment Officer, 3rd Cl., August 10th.

Schools of Instruction.—Schools of Aerial Gunnery.—Comdt.—(Graded as a Wing Comdr.).—Capt. (temp. Maj.) R. Bell-Irving, Canadian Local Forces, from a Comdt. (graded as a Sqdn. Comdr.), and to be temp. Lt.-Col. whilst so empld., Feb. 6th.

* * *

The King has been pleased to approve of the award of a Bar to the Distinguished Service Order to the following Officer:—

Sqdn.-Comdr. Kenneth Stevens Savory, D.S.O., R.N.A.S.

In recognition of his services on the night of July 9th, 1917, when a successful attack was carried out against the Turkish-German fleet lying off Constantinople. When the "Goeben," surrounded by warships (including submarines), had been located, the attack was made from a height of 800 feet. Direct hits were obtained on the "Goeben" and on the other enemy ships near her. Big explosions took place on board them, followed by a heavy conflagration. The War Office at Constantinople was also attacked, and a direct hit obtained.

* * *

The King has been pleased to award the Distinguished Service Cross to the following Officers:—

Flt. Lt. Henry McClelland, R.N.A.S., and Lt. Percy Townley Rawlings, R.N.V.R.

In recognition of their services on the night of July 9th, 1917, when a successful attack was carried out against the Turkish-German fleet lying off Constantinople. When the "Goeben," surrounded by warships (including submarines), had been located, the attack was made from a height of 800 feet. Direct hits were obtained on the "Goeben" and on the other enemy ships near her. Big explosions took place on board them, followed by a heavy conflagration. The War Office at Constantinople was also attacked, and a direct hit obtained.

Flt. Sub-Lt. Lacy Norman Glaisby, R.N.A.S.

In recognition of his services on July 20th, 1917, during a bombing raid on Aertrycke aerodrome. He was attacked by a hostile machine whilst over the target, and fought an engagement lasting 20 minutes. Flt. Sub-Lt. Glaisby was wounded in the head, and his observer was shot through the arm shortly after the engagement began, but they succeeded in driving the enemy machine down in a vertical nose-dive.

Flt. Sub-Lt. (Act. Flt. Lt.) Alfred Williams Carter, R.N.A.S.

This officer has at all times led his patrols with great courage, skill, and pertinacity, often engaging superior numbers of hostile aircraft. On July 22nd, 1917, he engaged single-handed for half an hour five enemy scouts, which he prevented from carrying out a reconnaissance. On July 24th, 1917, with one other pilot he attacked four enemy aircraft, one of which he drove down completely out of control.

Flt. Lt. Lancelot Giberne Sieveking, R.N.A.S., and Flt. Sub-Lt. John Roy Allan, R.N.A.S.

In recognition of their services in dropping bombs on enemy railway lines and ammunition dumps on the night of July 11th-12th, 1917.

Obsr. Lt. Ronald George St. John, R.N.A.S.

In recognition of his services on July 20th, 1917, during a bombing raid on Aertrycke aerodrome. After the bombs had been dropped on the objective, his machine was attacked by an Albatros Scout, which he shot down at point-blank range. Another hostile machine then attacked, but was driven off.

* * *

The King has been pleased to award a Bar to the Distinguished Service Cross to the following Officer:—

Flt. Comdr. Thomas Frederick Le Mesurier, D.S.C., R.N.A.S.

For consistent skill and courage in leading his flight on bombing raids, particularly on July 28th, 1917.

* * *

The following awards have also been approved:—

Distinguished Service Medal.

A.C., 2nd Gr., L. N. Saw, O.N. F16741; Act. Air Mech., 1st Gr., J. McKimmie Young, O.N. F3652; Air Mech., 1st Gr., P. J. Adkins, O.N. F2763; Air Mech. 1st Gr., F. J. George, O.N. F1997; C.P.O. Mech., 2nd Gr., J. L. Adams, O.N. F348; Ldg. Mech. B. Cromack, O.N. F9156.

* * *

The King has been pleased to award the Meritorious Service Medal to the following non-commissioned officers and man in recognition of valuable services rendered with the armies in the field during the present war:—

1859 Cpl. R. Colwill, R.F.C.
8268 1st Cl. Air Mech. J. F. Wilder, R.F.C.
2567 Sgt. H. H. Wright, R.F.C.

* * *

Awarded the Meritorious Service Medal, for valuable services rendered with the armies in the field, in Mesopotamia:—

78169 Cpl. P. Phillips, R.F.C.

* * *

The following Officer and Man have been mentioned in dispatches:—

Flt. Sub-Lt. H. B. Smith, R.N.A.S.
Air Mech., 2nd Gr., E. W. Argent, O.N. F13482.

Correction.

"Gazette" of August 11th, 1917.—For Flt. Sub-Lt. Ellis Vair Reed, R.N.A.S., read Flt. Sub-Lt. Ellis Vair Ried, R.N.A.S.

* * *

The following Decorations have been conferred by the Allied Powers on Officers of the British Naval Forces for distinguished services rendered during the war:—

CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

Croix de Guerre.

Flt. Lt. William E. Robinson, R.N.A.S.

CONFERRED BY THE KING OF THE BELGIANS.

ORDER OF LEOPOLD.

CHEVALIER.

Flt. Comdr. Sidney V. Sippé, D.S.O., R.N.A.S.

ORDER OF THE CROWN.

CHEVALIER.

Sqdn. Comdr. Reginald L. G. Marix, D.S.O., R.N.A.S.; Sqdn. Comdr. John P. Wilson, D.S.C., R.N.A.S.; Flt. Comdr. John S. Mills, D.S.C., R.N.A.S.; Flt. Lt. Ralph H. Collett, D.S.C., R.N.A.S.

The King has given unrestricted permission to the Officers concerned to wear the Decorations in question.

WAR OFFICE, August 31st.

REGULAR FORCES—ESTABLISHMENTS—R.F.C.—MIL. WING.—Sqdn. Comdrs.—From Flt. Comdrs. and to be temp. Majs. whilst so empld.:—Lt. (temp. Capt.) D. M. King, Res. of Officers, Jan 25th. Lt. (temp. Capt.) R. H. S. Mealing, Spec. Res., Feb. 1st. Lt. (temp. Capt. H. I. F. Yates, M.C., Spec. Res., May 10th. Temp. Capt. J. T. Whitaker, M.C., Gen. List, June 21st. Sec. Lt. (temp. Capt.) C. S. Duffus, M.C., Spec. Res., June 26th. Sec. Lt. (temp. Capt.) R. Gregory, M.C., Conn. Rang., Spec. Res., July 6th. Temp. Capt. J. B. Graham, M.C., Gen. List, August 1st. Lt. (temp. Capt.) A. L. Neale, M.C., Linc. R., August 15th. Sec. Lt. (temp Capt.) W. V. Strugnell, M.C., Hamps. R., Sept. 1st.

Equipment Officers, 1st Cl.—From the 2nd Cl., and to be temp. Capts, whilst so empld.:—Temp Lt. C. H. Nathan, Gen. List; temp. Lt. W. B. Carnley, Gen. List, July 23rd.

* * *

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign. The King has given unrestricted permission in all cases to wear the Decorations and Medals in question:—

PRESENTED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

LEGION D'HONNEUR.

CROIX DE CHEVALIER.

Brev. Maj. (temp. Lt.-Col.) J. E. Tennant, M.C., Scots Gds. and R.F.C.

MÉDAILLE MILITAIRE.

Z.92 Flt. Sgt. A. J. Adams, R.F.C.

133 2nd Grade C.P.O. E., A. H. Simmonds, R.N.A.S.

CONFERRED BY THE KING OF ITALY.

SILVER MEDAL FOR MILITARY VALOUR.

Lt. (temp. Capt.) G. D. Gardner, Yorks R. and R.F.C.

WAR OFFICE, Sept. 1st.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.——Brig.-Gen., R.F.C. Staff.—(Graded as a Brig.-Comdr.).—Maj. (temp. Lt.-Col.) G. Livingston, C.M.G., Lond. R., T.F., from a Staff Officer, R.F.C., 1st Cl. (graded as an A.A.G.), and to be temp. Brig.-Gen. whilst so empld., Aug. 9th.

Staff Officers, 1st Cl.—(Graded as an A.A.G.).—Bt. Maj. B. C. Fellows, ret. pay, Ind. Army, from a G.S.O., 2nd Gde., and to be temp. Lt.-Col. whilst so empld., vice Maj. (temp. Lt.-Col.) G. Livingston, C.M.G., Lond. R., T.F., Aug. 9th. 2nd Cl.—(Graded as G.S.O.'s, 2nd Gde.).—Temp. Maj. G. P. Myers, M.G. Corps, from an Instr. in Gunnery (graded as an Equipment Officer, 1st Cl.); Maj. D. H. Cameron, ret. pay, Ind. Army, from a G.S.O., 3rd Grade; Sec. Lt. (temp. Capt.) H. L. Webb, Spec. Res., from a G.S.O., 3rd Grade, Aug. 7th. Lt. (temp. Capt.) J. H. Simpson, Spec. Res., from the 3rd Cl. (graded as a G.S.O., 3rd Grade), and to retain his temp. rank whilst so empld., vice Bt. Maj. (temp. Lt.-Col.) B. C. Fellows, ret. pay, Ind. Army, Aug. 9th. (Graded as a Brig.-Maj.).—Temp. Lt. L. P. Ball, Gen. List, from an Equipment Officer, 2nd Cl., and to be temp. Capt. whilst so empld., Aug. 9th. 3rd Cl.—(Graded as G.S.O's., 3rd Grade).—Maj. J. M. Boyd, Sco. Rif., T.F.; Capt. J. St. A. King, Ind. Army, Inf., vice Maj. D. H. Cameron, ret. pay, Ind. Army; Lt. (temp. Capt.) H. A. Fordham, North'd. Fus., from a Flt. Comdr., vice Sec. Lt. (temp. Capt.) H. L. Webb, Spec. Res.; Lt. (temp. Capt.) R. H. Peto, Gen. List, from an Adjt., R.F.C.; Sec. Lt. W. Hodgson, W. Rid. R., to be temp. Capt. whilst so empld., and to be secd., Aug. 7th. Capt. S. C. Raffles, R.W. Fus., Spec. Res., from an Adjt. vice Lt. (temp. Capt.) J. H. Simpson, Spec. Res., Aug. 9th. (Graded as a Staff Capt.).—Sec. Lt. A. S. Barnfield, Yeo., T.F., from an Equipment Officer, 3rd Cl., and to be temp. Capt. whilst so empld., Aug. 9th.

Sqdn. Comdr.—Maj. (temp. Lt.-Col.) W. D. Beatty, R.E., from an Asst. Dir. at War Office, and to relinquish his temp. rank, Aug. 13th, seny. Nov. 9th, 1914.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld.:—Sec. Lt. (temp. Lt.) F. Rose, E. York R., Spec. Res., Aug. 14th. Temp. Sec. Lt. E. H. G. Sharples, Gen. List., Aug. 16th. Sec. Lt. (temp. Lt.) A. D. Pryor, Cambs. R., T.F.; Lt. J. M. Burd, R.A.; Sec. Lt. M. W. Wilson, Spec. Res.; Temp. Sec. Lt. J. H. O. Jones, Gen. List; Temp. Sec. Lt. C. Ryder, Gen. List, Aug. 17th. Lt. F. J. Morse, K.R.R.C., Spec. Res., Aug. 18th. Sec. Lt. D. McC. Kerr, Spec. Res.; Temp. Sec. Lt. J. S. Leslie, Gen. List, Aug. 19th. Sec. Lt. (temp. Lt.) R. A. James, Midd'x R., Spec. Res.; Sec. Lt. (temp. Lt.) J. S. Windsor, S. Wales Bord.; Sec. Lt. H. H. James, Spec. Res., Aug. 20th.

Gen. List.—Lt. K. H. Marshall, Lond. R., T.F., to be temp. Capt. (without pay and allowances of that rank) while empld. as Adjt., March 11th.

MEMORANDUM.—Hon. Lt. to be Hon. Capt. whilst empld. as Inspr., Aeronautical Inspn. Dept.:—C. H. Adams, W. A. Thain, K. Robertson, S. G. Young, June 1st.

WAR OFFICE, Sept. 3rd.

REGULAR FORCES.—STAFF.—ATTD. TO HEADQUARTER UNITS.—Comdr.—Bt.-Col. (temp. Brig.-Gen.) E. B. Ashmore, C.M.G., M.V.O., R.A., and to be temp. Maj.-Gen. whilst so empld., July 30th, 1917.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Sqdn. Comdr.—Temp. Capt. E. E. Clarke, Gen. List, from a Flt. Comdr., and to be temp. Maj. whilst so empld., Aug. 15th.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld.:—Lt. J. H. Butler, R. Ir. Rif., Spec. Res., Aug. 19th. Temp. Sec. Lt. T. C. Arnot, Gen. List, Aug. 22nd.

Adjt.—Sec. Lt. (temp. Lt.) J. A. Hartcup, E. York R., to be temp. Capt. (without pay and allowances of that rank) whilst so empld., and to be secd., Aug. 20th.

Equip. Officers, 1st Cl.—From the 2nd Cl., and to be temp. Capts. whilst so empld.:—Lt. A. Sowden, W. York R., T.F., June 1st. Temp. Lt. S. Frost, Gen. List, Aug. 1st.

FROM THE COURT CIRCULAR.

WINDSOR CASTLE, August 29th.

The following Officers had the honour of being received by His Majesty, when the King invested them with the Insignia of Companions of the Orders into which they have been admitted:—

THE VICTORIA CROSS, THE DISTINGUISHED SERVICE ORDER, AND THE MILITARY CROSS.

Capt. William Bishop, Canadian Cavalry, attd. R.F.C.

THE VICTORIA CROSS.—For most conspicuous bravery, determination and skill.—Captain Bishop, who had been sent out to work independently, flew first of all to an enemy aerodrome; finding no machine about, he flew on to another aerodrome about three miles south-east, which was at least 12 miles the other side of the line. Seven machines, some with their engines running, were on the ground. He attacked these from about 50 feet, and a mechanic, who was starting one of the engines, was seen to fall. One of the machines got off the ground, but at a height of 60 ft. Capt. Bishop fired 15 rounds into it at very close range, and it crashed to the ground. A second machine got off the ground, into which he fired 30 rounds at 150 yards, and it fell into a tree. Two more machines then rose from the aerodrome. One of these he engaged at the height of 1,000 feet, emptying the rest of his drum of ammunition. This machine crashed 300 yards from the aerodrome, after which Capt. Bishop emptied a whole drum into the fourth hostile machine, and then flew back to his station. Four hostile scouts were 1,000 feet above him for about a mile of his return journey, but they would not attack. His machine was very badly shot about by machine-gun fire from the ground.

THE DISTINGUISHED SERVICE ORDER AND THE MILITARY CROSS AND BAR.

Capt. Charles Campbell, R.F.C.

THE DISTINGUISHED SERVICE ORDER AND THE MILITARY CROSS.

Capt. Arthur Coningham, R.F.C.

THE DISTINGUISHED SERVICE ORDER.

Major Joseph Landon, Essex Regt. and R.F.C.

Qrmr. and Hon. Maj. Arthur Landen, North'd Fus. and R.F.C.

* * *

His Majesty then conferred decorations as follows:—

THE DISTINGUISHED SERVICE CROSS AND BAR.

Flt. Comdr. Thomas Le Mesurier, R.N.A.S.

THE DISTINGUISHED SERVICE CROSS.

Actg. Flt. Comdr. Arthur Allen, R.N.A.S.

THE MILITARY CROSS.

Capt. John Norton, General List and R.F.C.

Lt. Ernest Green, R.E. and R.F.C.

Lt. Campbell Hoy, R.F.C.

Lt. David Scott, A.C.C. and R.F.C.

Lt. Richard Trevethan, S. Lanc. Regt. and R.F.C.

Sec. Lt. William Matheson, General List and R.F.C.

NAVAL.

The following appointments have been made in the Royal Naval Air Service.

August 28th.—Lt., R.N.V.R. (temp.).—A. R. S. C. Kennedy, granted temp. comm. as Observer Lt., seny. Feb. 25th, 1916.

August 30th.—Mr. J. B. Homer entered as temp. Lt. (R.N.V.R.), to date Aug. 28th.

Temp. Lt. (R.N.V.R.) G. D. Nelson entered as temp. proby. Flt. Lt., to date Aug. 27th.

Temp. Engr. Sub-Lt. (R.N.V.R.) J. H. Taylor granted temp. comm. as Lt. (R.N.V.R.), with seny. Aug. 27th (temp. comm. as Engr. Sub-Lt. terminated).

August 31st.—Actg. Flt. Lt. (temp.).—A. W. Carter, D.S.C., specially promoted to rank of Flt. Lt. (temp.) for meritorious service in the field, seny. Aug. 28th.

Temp. comm. (R.N.V.R.) is granted, seny. as stated:—Lt.—E. A. Gordon, Aug. 30th.

Messrs. E. Barrett, B.Sc., F.C.S. (P.O.), and R. Ferguson, M.A. (L.M.), both granted temp. comms. as Lt. (R.N.V.R.), seny. Aug. 29th.

Admiralty Communiqués.

Sept. 1st.—A bombing raid by the R.N.A.S. was carried out last night (August 31st) on Ghistelles aerodrome (about five miles south-east of Ostend). Several direct hits were made on the sheds in the south-west corner of the aerodrome, in which vicinity a fire was started.

Bombs were also seen to explode on the adjoining Ostend-Thourout railway line.

Many tons of explosives were dropped. All machines returned safely.

Sept. 4th.—In the course of the air raid last night the following casualties were caused to naval ratings:

Killed, 107; wounded, 86.

The Casualty List.

Reported August 30th.

Died of Injuries.—Ferrier, Prob. Flt. Officer W. F., R.N.

Previously reported Missing, now presumed Killed.—Todd, Flt. Lt. A. S., R.N.

Allaway, Flt. Sub-Lt. W., R.N.

Missing.—Booth, Flt. Sub-Lt. H. H., R.N.

Lewis, Flt. Sub-Lt. A. D. M., R.N.

Slightly Injured.—Alexander, Flt. Sub-Lt. P. M., R.N.

Reported Sept. 1st.

Injured.—Amos, Flt. Sub-Lt. J. W. P., R.N.

Reported Sept. 3rd.

Slightly Injured.—Wallis, Flt. Lt. A.A., R.N.

Lewis, Flt. Sub-Lt. A. V., R.N.

PERSONAL NOTICES.

Deaths.

HELBERT.—Flt. Sub-Lt. Alfred Basil Helbert, R.N., who died on Aug. 29th, very suddenly, as the result of an immersion in North Sea in Oct., 1916, was the son of Lt.-Col. Herbert, S. African Forces, and Mrs. Helbert. He was 22 years of age.

LEWIS.—Flt. Sub-Lt. Frank C. Lewis, R.N., who was killed on August 21st, aged 19, was the only son of the late Frank B. Lewis and of Mrs. Lewis, of 18, Craven Hill Gardens, W. He was educated at Northdown Hill, Cliftonville, and Marlborough College (Field House). On leaving school at Christmas, 1916, he applied for a commission in the R.N.A.S., which he entered last February. He went to the front on August 9th

His squadron commander writes:—"He fell in action in an aerial battle and fought bravely to a noble end. Your son came to me just over a week ago. I took him on his first flight here to show him the country. He soon proved a brilliant pilot, and I am certain would have done awfully well. . . . "

THOMAS.—Flt. Sub-Lt. J. E. Thomas, R.N., was killed in a flying accident at Yeovil on Sept. 3rd, and a passenger, Mr. Robert Norton, was seriously injured. The machine rose successfully but, in an attempt to turn, it nose-dived from a height of 300 to 400 ft. and was wrecked. The pilot was instantly killed and the passenger was severely injured.

Engagement.

MAXTON—CHAPMAN.—The engagement is announced of Flt. Sub-Lt. Leonard G. Maxton, R.N., only son of Mr. and Mrs. James Maxton, Belfast, and Ruby, only daughter of Mr. and Mrs. Dartford Holmes, of Huddersfield, and only granddaughter of the late Henry J. Chapman, Westgate-on-Sea, Kent.

Marriage.

WALLERS—DENHAM.—On August 25th, at St. Mary Magdalene, Wandsworth Common, Flt. Sub-Lt. Frederick Harold Wallers, R.N., eldest son of Mr. and Mrs. W. F. Wallers, of Johannesburg, was married to Olive Marjorie, only daughter of Mr. and Mrs. H. W. Denham, of Wandsworth Common, S.W.

Birth.

McBAIN.—On August 30th, at "Glenhaven," Taplow-on-Thames, the wife of Flt. Sub-Lt. G. B. S. McBain, R.N.A.S., of a son.

Boys are required for training as wireless telegraphists in the Royal Naval Air Service. Entry for three months' probation, and after for period of hostilities; 50 per cent. allowed transfer to permanent service. Candidates must be between the age of 17 years and 17 years and six months, and prepared to carry out flying duties in any type of aircraft at home or abroad. Pay 1s. per day and all found to age of 18, then pay of men's ratings. Apply in writing, stating exact date of birth, to N. 4 Section, Room 493a, Hotel Cecil, Strand, London, W.C.2.

Unskilled men between 18 and 45, medically classified B1 and below, are wanted for the Royal Naval Air Service for entry as aircraftmen, 2nd class, at 1s. 3d. a day; Naval separation allowance. Apply Admiralty Recruiting Department, Great Scotland Yard, W.1, or any Naval Recruiting Office or Employment Exchange. Men serving in the Army are not eligible.

MILITARY.

G.H.Q. Communiqués.

August 28th, 9.10 p.m.—In spite of the rain and strong wind, our aeroplanes maintained contact with our infantry throughout yesterday's operations north-east of Ypres, and successfully engaged the enemy's troops and transport with machine-gun fire.

All our machines returned.

Sept. 1st, 9.25 p.m.—Yesterday evening the weather cleared for two hours, and for the first time for four days normal aerial activity was resumed. In air fighting one German machine was brought down in our lines, and another was driven down out of control.

One of our aeroplanes is missing.

Sept. 2nd, 8.53 p.m.—Little flying was possible yesterday owing to rain and high wind, but during the previous night bombing operations were carried out actively by our aeroplanes against hostile aerodromes and railway stations. In air fighting one German machine was brought down.

Two of our machines are missing.

Sept. 3rd, 8.57 p.m.—Last night our aeroplanes dropped over three tons of bombs on the enemy's aerodromes, with good results.

In air fighting one German machine was brought down and one driven down out of control.

One of our aeroplanes is missing.

* * *

War Office Communiqué.

August 31st.—The G.O.C. the British Forces in Macedonia reports:—

Our aeroplanes have raided Dutli, Demirhissar and Stojakovo.

August 31st.—The G.O.C. the British Forces in Palestine reports:—

On August 28th and 29th our aeroplanes, flying at a low altitude, carried out successful operations in the Maan district (south-east of Beersheba). Eight direct hits were observed on the engine sheds at Maan, where noticeable damage was caused to a field artillery battery and to other hostile troops.

All our aeroplanes returned safely.

* * *

Home Command Communiqués.

Sept. 2nd, 11.50 p.m.—Hostile aeroplanes crossed the East Kent coast at about 11.15 to-night, and flew seawards a few minutes later.

A few bombs were dropped.

There is no detailed information as regards casualties, but they are believed to be small.

Sept. 3rd, 10.20 a.m.—Last night's raid was carried out by only one enemy aeroplane, which bombed Dover at a few minutes after 11 p.m.

Seven bombs were dropped.

One man was killed and four women and two children slightly injured.

Sept. 3rd, 11.45 p.m.—Enemy's aeroplanes crossed the South-East Coast at about 11 p.m. and dropped bombs at various places.

No reports of casualties or damage have been received as yet.

A number of our machines went up in pursuit.

Sept. 4th.—Last night's raid was carried out by about six enemy aeroplanes, which proceeded up the south bank of the Thames Estuary as far as Chatham. Bombs were dropped in the Isle of Thanet and in Sheerness-Chatham area, between 10.40 and 11.30.

There were no Army casualties. Civilian casualties reported at present are: Killed, 1; injured, 6.

Material damage was slight. Our machines went up and anti-aircraft guns came into action, but without result.

The Casualty List.

Reported August 29th.

Killed.—Best, Sec. Lt. D. K., Essex R. and R.F.C.

Brown, Sec. Lt. E. J., R.F.C.

Dunstan, Sec. Lt. H., Y. and L. R., attd. R.F.C.
Forsaith, Sec. Lt. H. J., R.F.C.
Sayer, Sec. Lt. H. L., R.F.A., attd. R.F.C.
Tobin-Willis, Lt. J. G., A.S.C., attd. R.F.C.

WOUNDED.—Gough, Sec. Lt. H. S., Manch. R. and R.F.C.
Hay, Lt. O. D., Gord. High. and R.F.C.
Turner, Lt. M. W., R.G.A. and R.F.C.
Van Ryneveld, Maj. H. A., M.C., R.F.C.

MISSING.—Barton, Lt. A. E. S., R.F.A. and R.F.C.
Churchward, Sec. Lt. H. A., Yeo. and R.F.C.
Glover, Lt. A. M. T., K.O.S.B., attd. R.F.C.
Leighton, Lt. R. T., Yeo. and R.F.C.
O'Brien, Sec. Lt. P. A., R.F.C.
Phelan, Sec. Lt. R. S., R.F.C.
Raper, Sec. Lt. S. E., Sea. High. and R.F.C.
Roadley, Lt. T. S., S. Staff. R., attd. R.F.C.
Thompson, Lt. C. D., H.A.C. and R.F.C.
Waters, Lt. C. B., Lond. R. and R.F.C.
Wright, Lt. M. T., L. N. Lan. R. and R.F.C.

CANADIAN FORCE.—KILLED.—Doran, Lt. F. B., Cent Ont. R., attd. R.F.C.

WOUNDED.—Cooke, Lt. W. R., M.G.C., attd. R.F.C.

MISSING.—Gray, Lt. L. V., Sask. R., attd. R.F.C.
Joslyn, Lt. H. W., Sask. R., attd. R.F.C.
MacFarlane, Lt. J. L., B. C. R., attd. R.F.C.
McNally, Lt. P. B., Alta. R., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Sliter, Lt. E. D., Rly. Troops, attd. R.F.C.
Reported August 30th.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Hopwood, Capt. R. G., Rif. Brig., attd. R.F.C.

DIED OF WOUNDS.—Thorndike, Sec. Lt. F. H., Yeo. and R.F.C.

WOUNDED.—Macfarlane, Capt. A. L., R.F.C.
Mackay, Sec. Lt. G. F., R.F.C.
Scudamore, Sec. Lt. H. G., R.W. Kent. R., attd. R.F.C.
Wallace, Sec. Lt. E. E., R. Fus., attd. R.F.C.

MISSING.—Abbott, Sec. Lt. T. W., R.F.C.
Bell, Sec. Lt. N., Ches. R., attd. R.F.C.
Dutton, Sec. Lt. R., R.F.C.
Fowler, Sec. Lt. J. O., R.F.C.
Harel, Sec. Lt. L. O., R.F.C.
Hart-Davies, Sec. Lt. H. R., R.F.A., attd. R.F.C.
Kirkness, Sec. Lt. T. R., R.F.C.
MacDaniel, Sec. Lt. J., R. Dub. Fus., attd. R.F.C.
Nicholson, Sec. Lt. M., R.F.C.
Rose, Sec. Lt. G. A., R.F.C.
Ross, Sec. Lt. C. M., R.F.C.
Rushworth, Capt. H. M., Lond. R. and R.F.C.
Styles, Sec. Lt. W. B., R.F.C.
Urquart, Sec. Lt. A., High. L.I. and R.F.C.

DIED OF WOUNDS AS PRISONER IN GERMAN HANDS.—Furniss, Sec. Lt. K. R., Yeomanry and R.F.C.
Reported August 31st.

KILLED.—Gordon, Sec. Lt. G. S., Cam. (Sco. Rif.), attd. R.F.C.
Tipping, Lt. F. B., R.G.A. and R.F.C.

WOUNDED.—Barton, Sec. Lt. C. H., R.F.C.
Walker, Sec. Lt. W., R.F.C.

MISSING.—Clement, Capt. C. M., R.F.C.
Gillespie, Sec. Lt. J. W., R.F.C.
Hood, Lt. J., Arg. and Suth'd. Highrs. and R.F.C.
Richards, Sec. Lt. C. R., M.C., R.F.C.
Thompson, Sec. Lt. S. F., Suff. and R.F.C.
Waring, Sec. Lt. H. E. A., R.F.C.
Reported Sept. 1st.

KILLED.—Payne, Sec. Lt. C. B., R.F.A., attd. R.F.C.

WOUNDED.—Britton, Lt. A. F., M.G.C., attd. R.F.C.
Bullock, Sec. Lt. R. N., S. Staff. and R.F.C.
Donnet, Lt. A. N., R.F.C.
Warman, Sec. Lt. C. W., R.F.C.

MISSING.—Adamson, Sec. Lt. C. P., R.F.C.
Cox, Sec. Lt. D. P., R.F.C.
Davies, Sec. Lt. C. W., R.F.C.
Richardson, Sec. Lt. J. L., Glouc. and R.F.C.
Smith, Capt. G. K., M.C., R.F.C.
Thompson, Sec. Lt. S., R.F.C.
Turner, Sec. Lt. H. D., R.F.C.
Winser, Sec. Lt. F. E., R.F.C.
Young, Sec. Lt. H. F., Sher. For., attd. R.F.C.

CORRECTION.—WOUNDED.—Jones, Sec. Lt. E. T. L., R.F.C., should read, Jones, Sec. Lt. E. T., R.F.C.
Reported Sept. 3rd.

KILLED.—Cobb, Lt. J. E., A.S.C., attd. R.F.C.
Curtis, Sec. Lt. F. W., R.F.C.
Solly, Capt. A. N., R.F.C.

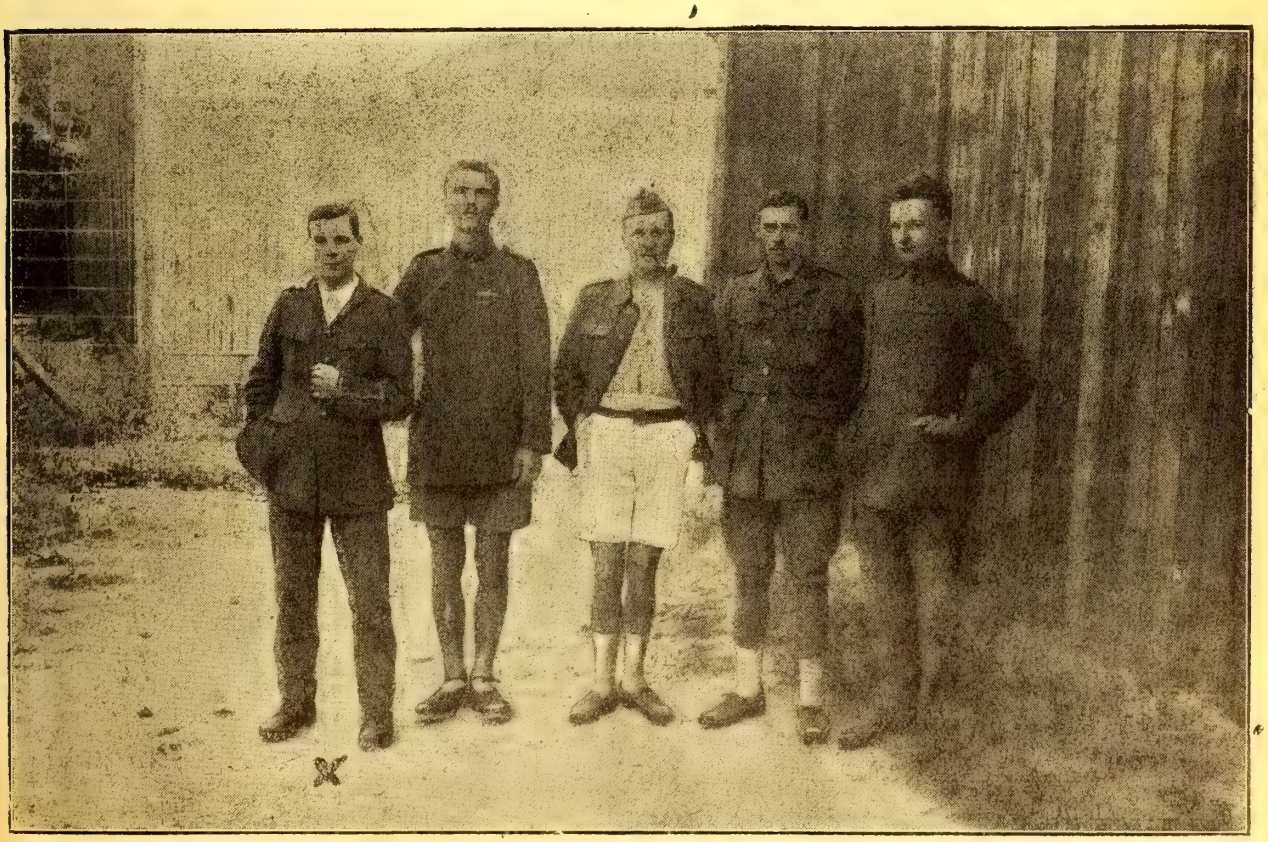
PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Cole, Sec. Lt. M. G., R.F.C.

DIED OF WOUNDS.—Hargreaves, Sec. Lt. C. A., R.F.C.
Leech, Sec. Lt. W. F., R.F.C.
Nicholson, Sec. Lt. G. A. S., R.F.C.

ACCIDENTALLY KILLED.—Davey, Sec. Lt. R. A., R.F.C.

WOUNDED.—Lamb, Sec. Lt. H. H. G., Conn. Rang., attd. R.F.C.

MISSING.—Barry, Lt. C., R. Ir. Regt., attd. R.F.C.
Falkiner, Sec. Lt. F. B., M.C., R. Ir. Rif., attd. R.F.C.
Keast, Sec. Lt. W. R., R.F.C.
Manners-Smith, Lt. J. A., R.G.A., attd. R.F.C.
Moody, Sec. Lt. C. A., R.F.C.
Pemberton, Capt. F. D., R.F.A., attd. R.F.C.
Raney, Sec. Lt. P. H., M.C., R.F.C.
Smith, Capt. A. H., M.C., R.F.C.
Waud, Lt. E. H., North'd. Fus., attd. R.F.C.



FIVE OLD PAULINES.—British Officers of the R.F.C., formerly of St. Paul's School, photographed when in the hands of the enemy at Karlsruhe.

Previously Reported Missing, now reported Prisoners of War in German Hands.—Atkins, Sec. Lt. G. C., R.F.C.
Partington, Lt. O. J., R.F.C.
Australian Imperial Force.—Died of Wounds.—Edson, Sec. Lt. C. R., Fl. C.
Wounded.—Murray, Sec. Lt. G. I. L., Fl. C.

Reported Sept. 4th.

Killed.—Power, Sec. Lt. H. R., R. Ir. Rif., attd. R.F.C.
Wounded.—Barton, Sec. Lt. B. C. L., R.F.C.
Brown, Sec. Lt. H. O., R.F.C.
Price, Sec. Lt. J. H. R., Wilts R., attd. R.F.C.
Missing.—Garland, Sec. Lt. E. H., R.F.C.
Canadian Contingent.—Killed.—Davidson, Lt. D. G., Que. R., attd. R.F.C.
Wounded.—Given, Lt. R. F., Man. R., attd. R.F.C.
Missing.—Carter, Lt. R. B., Alta R., attd. R.F.C.
Godwin, Lt. T. E., Inf. attd. R.F.C.
Hutcheson, Lt. W. B., Eng., attd. R.F.C.
Kennedy, Lt. H. A., Inf., attd. R.F.C.
Walker, Capt. W. H., Inf., attd R.F.C.
Prisoner in German Hands.—Lee, Lt. A. C., Cent. Ont. R., attd. R.F.C.
Australian Force.—Wounded.—Epps, Sec. Lt. A. M., Fl. C.
McCloughy, Lt. E. J., Fl. C.

* * *

Casualties among N.C.O.'s and Men. The dates are those of the official list :—

Died of Wounds.

August 22nd.—R.F.C.—Eldridge 8306 2nd Cl. Air Mech W. H. Chiswick Park, W.).

Died.

August 21st.—R.F.C.—Angus 47406 2nd Cl. Air Mech. J. E. (Leeds); Lyons 18286 1st Cl. Air Mech. A. F. (Bethnal Green, E.).
August 25th.—Humby 52995 2nd Cl. Air Mech. A. (Sudbury).

Wounded.

August 22nd.—R.F.C.—Bennetts 30163 2nd Cl. Air Mech. H. V. (Lewisham, S.E.); Brooks 8486 2nd Cl. Air Mech. C. V. (Shepherd's Bush, W.); Hasler 50627 2nd Cl. Air Mech. C. W. (Islington, N.); Hughes 8418 1st Cl. Air Mech. J. (Sydenham, S.E.); Kirwin 45221 2nd Cl. Air Mech. H. (Lincoln); Lovell 9972 2nd Cl. Air Mech. S. C. (Penge, S.E.); Rowlett 44246 2nd Cl. Air Mech. H. V. (Peterborough); Thompson, 55957 2nd Cl. Air Mech. A. B. (Sydenham, S.E.).
August 24th.—Hubbard 44992 2nd Cl. Air Mech. C. (Stoke Newington, N.); Palmer 61123 3rd Cl. Air Mech. E. (Leamington); Prosser 10605 1st Cl. Air Mech. S. (Gloucester); Rutherford 48553 3rd Cl. Air Mech. J. E. (Haswell).
August 25th.—Beardmore 6509 1st Cl. Air Mech. G. A. (Blackpool); Collins 8205 1st Cl. Air Mech. J. G. (Clapham, S.W.); Evans 56616 2nd Cl. Air Mech. F. J. C. (Battersea, S.W.); Griffiths 10193 1st Cl. Air Mech. D. N. (Landore); Henderson 7226 1st Cl. Air Mech. V. R. (Bowes Park, N.); Holmes 12407 2nd Cl. Air Mech. A. G. (Camden Square, N.W.); North 6388 Flt. Sgt. L. (South Farnborough); Robinson 801 1st Cl. Air Mech. R. J. (Middlewich); Stone 14226 Cpl. J. (Greenock); Wetherill 13922 1st Cl. Air Mech. A. J. (Dunstable); Woollin 8687 1st Cl. Air Mech. H. (East Ardsley); Young 13251 2nd Cl. Air Mech. A. W. (South Shields).

Missing.

August 24th.—R.F.C.—Parry 2758 Sgt. A. E. (Bargoed).
Previously Missing, now reported Died as Prisoners of War in Turkish Hands.
August 20th.—Devonshire Regt., attd. R.F.C.—Braund 2900 W. (Brampton).
August 21st.—R.F.C.—Butler 6242 2nd Cl. Air Mech. S. G. (Barry).

PERSONAL NOTICES.

Deaths.

BUCKERIDGE.—Lt. Guy Dennis Buckeridge, 60th Rifles and R.F.C., was killed as a result of an aeroplane accident at Swaffham, Norfolk, on August 22nd, 1917.

The younger son of Major and Mrs. A. D. Buckeridge, Johannesburg, South Africa, he was born in 1894. Mr. Buckeridge served with the Burgher Commando in the Orange Free States from the outbreak of war until the end of 1914, after which he joined the S.A. Mounted Rifles and went through the German S.W. African campaign until the surrender at Otavi in July, 1915. He came to England for service with the 60th Rifles, and afterwards graduated in the R.F.C., in September, 1916.

After much work over the lines in France, he became Communication Pilot for G.H.Q. As such he was a familiar figure in many aerodromes in France, and will be missed by his many friends.

He was killed within a few days of his return to England. In February, 1917, he married Janet, daughter of Dr. and Mrs. Rice, of Harwell, Steventon, Berks.

BUTLER.—An aeroplane, with two passengers, flying at a height of 1,500 ft. over Lincolnshire on August 27th, got out of control and fell in a field about two miles from a town. Both aviators were killed. The pilot was Capt. Butler, R.F.C., who was just home after twelve months' flying in France. His home was at Leeds. The other aviator was a Cadet.

BUXTON.—George Barclay Buxton, who was killed in a flight over the German lines on July 28th, was the third son of the Rev. Barclay Fowell Buxton, of Kobe, Japan, aged 24.

DAVEY.—Sec. Lt. Roland Alfred Davey, R.F.C., of Margate, was accidentally killed on August 8th, while flying abroad. He was 20 years of age.

HAY.—Lt. Roger Bolton Hay, M.C., West Yorkshire Regt., attd. R.F.C., previously reported missing on July 17th, is now reported to have died of wounds as a prisoner in German hands on that day. He was 22 years of age, and was the youngest son of the Rev. R. W. Hay, late rector of Garsdon, Wilts, and Mrs. Hay. He was educated at Dean Close, Cheltenham, and afterwards at Blundell's, whence he was proceeding to Oxford when war broke out. With his two brothers he joined the Universities and Public Schools Brigade, and in January, 1915, all three were given commissions and gazetted to the West Yorkshire Regt. In July, 1915, he was ordered to the front, but owing to a motor-cycle accident did not go out until February, 1916, from which date he served in the trenches until August, when he joined the R.F.C. and returned to England. After obtaining his pilot's certificate he again went to the front last April In June he was awarded the Military Cross. The official notification states :—"On several occasions he has shown the utmost courage and dash in attacking and dispersing hostile aircraft in superior numbers. His willingness to undertake the most hazardous duties has at all times set a fine example to other pilots and observers of his squadron." His commanding officer writes :—"His loss to my squadron is considerable in more ways than one; first, he was a top-hole pilot, a thorough sportsman, a brave and plucky fighter, who, as you probably know, downed more than one hostile machine. He was probably one of the best liked and most popular officers in my squadron."

His observer in a letter writes :—"My pilot and I were attacked by six enemy scout aeroplanes. To start with, my gun jammed, and we were then pretty well helpless, and it was impossible to remedy it. We were a good many miles over the line, and my pilot made a really wonderful fight from 14,000 ft. down to the ground; he looped, spun, and did everything he could to shake the enemy off. He was badly hit in the body towards the end and had to land on the beach. We got out, and I helped him along when I was shot in the leg as I was doing so. It was awful bad luck, for we were only about three to four hundred yards from our line."

KEYSER.—Lt. Richard Keyser, R.F.C., whose death was announced last week, was educated at Uppingham School. When the war broke out he left Smyrna with 20 young British residents and joined the colours. As second lieutenant in the East Lancashire Battalion he was present at several engagements in France, and was promoted to the rank of lieutenant. Subsequently he was ordered to Salonika on special duty as an intelligence officer, but later transferred to the R.F.C., and after a course of training in Egypt, where he obtained his wings, returned to England six weeks ago.

KINKEAD.—While flying along the south coast on Sept. 3rd, Lt. Kinkead, R.F.C., nose-dived from a height of about 300 ft. and fell into a meadow near the railway line at Worthing. He was killed and his machine was smashed to pieces.

MALONE.—Reginald John Malone, R.F.C., who was killed while flying in England on August 30th, was the only child of Mordred and Ethel Malone, Bedford, and grandson of Col. Malone, Baronston, Westmeath. He was 17½ years of age.

MARSHALL.—Sec. Lt. Herbert William Hare Marshall, R.F.C., killed in a flying accident in Lincolnshire on August 26th, was the only son of Col. H. S. Marshall, 28th Punjabis, and Mrs. Marshall, of 19, Exeter Road, Weston-super-Mare. Born in 1890 at Mussouri, India, he was educated at Clarence School, Weston-super-Mare. He went out to Canada at the age of 17, and had a varied experience in farming, banking, and real estate. He also spent 18 months in California. He was a member of the Imperial Bank of Canada when war broke out, and at once enlisted, together with his brother-in-law, Capt. Erland G. Hadow, M.C. (killed in action on May 29th), in a Canadian contingent, and came over to England in 1915. Subsequently he obtained a commission in the West Yorkshire Regt. He served six months in France, and then joined the Flying Corps, and gained his wings in Oct., 1916. He again went to the front, and there met with a smash, which caused his return to England. Lt. Marshall was married on May 12th to Evelyn M. Orr-Ewing, of Weston-super-Mare.

(*Continued on page* 685.)

AERONAUTICAL ENGINEERING

SUPPLEMENT TO "THE AEROPLANE"

INCORPORATING AIRCRAFT ENGINEERING, AERODYNAMICS, AND MATTERS PERTAINING TO THE AERONAUTICAL ENGINEER AND THE AIRCRAFT TRADER

Screws and Screw Threads in their Relation to Aircraft Construction.

BY V. P. BENEDICT.

Introductory.

So fundamental a necessity obtains for the strictest interchangeability and most systematic standardisation of all screwed parts and components employed in this—the newest and most progressive of industries—that a short exposition on the subject of screw threads is in strict accord with the instructive character of the Aeronautical Engineering Section of The Aeroplane.

The remarks appended make no pretensions in the direction of exhaustive review—rather they are to serve the definite purpose of amplifying and explaining in simple, non-technical language those tables of Standard Threads which follow.

Historical.

The principle of the screw thread is one of great antiquity; yet comparatively recent are all attempts to evolve ordered and reasoned standards out of the chaotic mass of forms and dimensions of screws originally employed in various industries and the works engaged therein.

Credit for the pioneer endeavours to standardise on a national scale lies to this country, and to Mr. (afterwards Sir) Joseph Whitworth, an original member of one of the then largest engineering concerns in the Kingdom, acknowledgment is due for his most energetic research work and the keenest advocacy of the necessity for uniformity of practice—not in screw threads alone, but in dimensions and forms of detail mechanical products generally.

To comprehend the extent to which interchangeability has been achieved, and its effect on aeroplane construction *en masse*, one needs only to consider the heterogeneous medley of separate establishments, of the most diverse calibre, and totalling in round figures well over one thousand, which are engaged in turning out in bulk the multitudinous pieces which are to assemble, without any regard to their source of origin, into the winged weapons of this most modern of warfare. This much visualised, ones debt to Sir Joseph Whitworth particularly and to his contemporaries for the foresight they exhibited may in some measure be appreciated.

Sir J. Whitworth's system of screw threads of 55 degree angle, approximately triangular in outline and with corners rounded, is now universally known as the English Standard Whitworth Thread. Varying ratios of dimensions have been adapted for different needs, the one outline being retained and used on 95 per cent. of engineering production.

This Screw Standard was not adopted without great expense and much controversy and opposition from those to whom the change meant the scrapping of existing forms, and thus it was regarded as preferable, rather than to devise a new form strictly theoretic, to adopt and standardise an outline or section and dimensions, which, as explained in the Whitworth paper entitled "A Uniform System of Screw Threads," laid before the Institute of Civil Engineers in 1841, consisted of a compromise approximating to the most commonly used of the then existing forms.

Such, then, is, in brief, an account of the first accepted National Standard form of thread, and although there appeared a preponderance of foreign opinion in favour of the angle 60 degrees, there is little tangible in the way of objection to the Whitworth form, and certainly nothing which could have weighed against the great advantage to be gained by employing the more generally favoured form at the then time in vogue.

The adoption of standards by the engineering communities of other countries naturally followed.

In the case of the United States they were—for a nation so progressive in things mechanical—surprisingly dilatory and procrastinating.

It was more than 20 years later that a Special Committee of the Franklin Institute was appointed "to investigate and recommend a Standard Screw Thread System for use in the United States."

Various forms were considered, and, naturally, the Whitworth English Standard, already long established, came under discussion, in the course of which the chief expressions of objection related to an angle of the somewhat odd figure of 55 degrees being less easy to lay out than the even 60 degrees, and also to the disadvantage of the rounded corners from a production point of view, as compared with plain flats.

Finally, the recommendation was made that the form and system of Mr. Wm. Sellers, based on the 60 degrees angle, and without rounded corners, be selected for acceptance. There appears, however, to have been some lack of comprehensiveness in the scheme as laid down, militating against complete interchangeability, since it is recorded that some years later (about 1876), after the system had been adopted some time by the Erie Railroad, this concern found it necessary to initiate an investigation into the difficulties which were being experienced in assembling screwed productions from their various shops.

Ultimately, however, in '82, after many years spent in discussion, the system appears to have been perfected into the existing United States Standard. Which all reads amazingly like a present-day comment on progress official in things aeronautical.

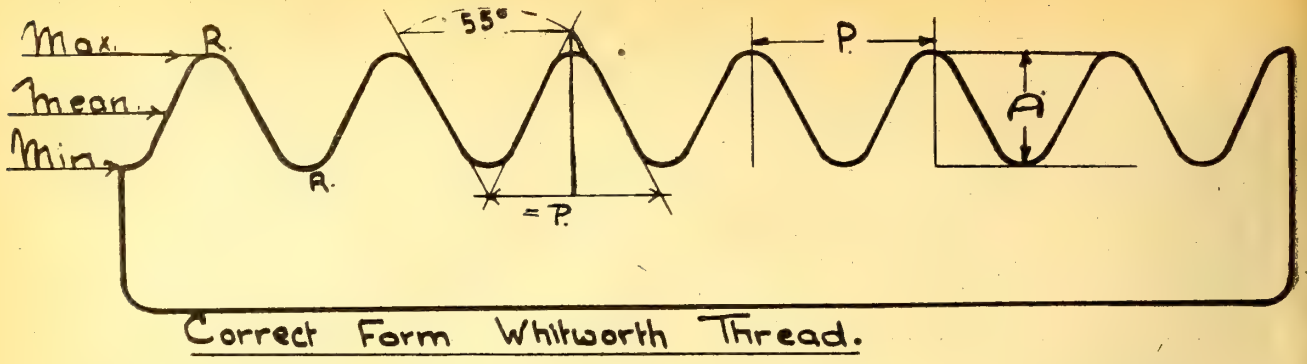
Turning to the Continent (discovered by Roosevelt, and labelled "Yurrup"), here the Metric System obtains, and an attempt has been made to evolve and adopt a definite standard of form and dimensions for universal use. The result is the thread known as the "Système International," recommended for acceptance by the International Congress for the Standardisation of Screw Threads assembled at Zurich in October, 1898, and based on the somewhat older French Metric Standard, agreeing in general therewith, subject to an unfortunately obscure amendment in outline, of which more anon.

The small screw system, known as the B.A. (British Association, by whom it was adopted in 1881) is, with slight exception in form, the same as that formulated by Prof Thury, and put forward by him in '76 to a Committee of the Geneva Convention called to consider a standard of small screws for the particular purposes of the watch, clock and instrument industries.

Technical—(1) Thread Forms or Sections.

The scope of this article is screw threads only so far as they apply to aeroplane construction, which limitation obviates the necessity to consider any but the "Vee" or triangular form—which is decidedly to the good in economy of words, for the basis of all these is an abbreviated isosceles triangle, so that a description or illustration lies generally, and dissimilarities call only for figured dimensions.

Taking, as is meet, the Whitworth form for my pictured example, the section is shown analysed, and reveals no less than seven separate and actually dimensioned elements. A fearsomeness more apparent than real, at one with most text-book and drawing office productions, clothed in symbols—mystic—wonderful, the whole intent of which is, nevertheless, capable of the simplest translation.



Correct Form Whitworth Thread.

From the like did Euclid coin his name and fame (and his coin, if any), for his art was the taking of basic essentials to be garlanded in fullest measure with the less obvious adjuncts therein contained and implied.

The screw thread formula is Euclid pure and simple.

In sectioned outline it is like to a row of blunt-nosed triangles, arranged consecutively, whereof the bases touch, and the inclined sides partially enclose spaces of identical form and dimensions.

From the seven thread elements one need take only two essentials, namely, the angle and the pitch. Use the pitch for a base length and project thereon the inverted angle thus to form the completed triangle—in itself a perfectly good theoretical thread form (and one used, *vide* the "sharp vee thread" occasionally met in American practice and—more often—in Yankee text-books) upon which all variants in standards of vee form are based.

Wherein lies simplicity, for in each standard form of thread the angle always remains a set and constant factor, and, from the variant element, the pitch, calculable every time as a set proportion of it, one can obtain strictly uniform ratios for each of the other dimensions.

It is written above that the triangular form in itself is a perfectly good theoretical thread outline, so it is good that one enlarges somewhat on the reasons for varying it. From a practical point of view, in the first place, sharp edges and corners are an abomination to produce, and when produced are extremely sensitive to damage and wear, alone sufficient grounds for avoiding them and applicable to mechanical products generally besides screw threads.

On the point of strength, too, the balance of advantage is against the full triangle. Sharp corners are notoriously obnoxious on the score of weakness they set up. Witness the ease with which a hefty bar of tough material can be snapped if a sharp notch is cut at the point where the break is desired. Still further, the actual tensile strength of a male screwed part is governed by the area of the core, which is equal to the amount of material left untouched by the screw-cutting, and which would remain if the thread were totally removed. Obviously, in cutting a thread on a given diameter—say 1 in.—by abbreviating the triangles, starting them as it were at a point part way down the slope from the peak, and by ending them off before they run to a pointed groove, one does not cut so deep into the metal, and thus leaves a larger core untouched.

So much, then, will suffice for the why of the outline abbreviation.

The application of Euclid to the triangle described as formed by the pitch length for base, with the 55 degree angle projected thereon, I will proceed with in the following *pot pourri* paragraph.

The triangle formed is an isosceles one, of which breed the height is always a set proportion of the length of the base, dependent on the angle between the sides. Sticking to Whitworth, his angle is 55 degrees, and the height from the centre of the base to the peak will invariably be 0.96049 times the length of the base, and the base is equal to the pitch, so one gets the height every time, and if one calls it 0.96 times the pitch, one will be near enough to pass inspection. The abbreviations are each one-sixth of the height and, therefore, one-sixth of 0.96 times the base/pitch, and, therefore, again 0.16 times the same. And if from 0.96 one knocks off 0.16 for the short peak and the same for the root, it leaves one with 0.64 times the base/pitch for the total remaining depth of thread.

Reverting, then, to the illustration and its seven-dimensioned elements, the first is the maximum diameter. This is given in the screw designation in company with the pitch, so needs no seeking. It may be referred to as the nominal size. As example, a male screw called for as $\frac{3}{8}$ in. by 16 T.P.I. (threads per inch) would be cut on a piece of circular section $\frac{3}{8}$ in. in diameter, and this is the diameter measured across the peaks of the threads which should remain when the screw is cut. If it does not, two A.I.D. marks and the scrap heap.

Secondly, the pitch is the distance in a straight line which is taken by one complete turn of the screw, otherwise the distance from the peak of one thread to the peak of the next. Given correctly—*á la* text-book—the pitch is the distance in a straight line measuring parallel with the axis of the screw between two adjacent sides of like inclination, and properly taken at a point halfway between the peak and the root, which point is named the pitch-line and also the effective diameter. All to show how involved and obscure the simplest of definable things can be made.

The value of the pitch is one inch divided by the number of threads contained in that length. Thus, 16 T.P.I. is the usual method of designating a screw having 16 complete threads in one inch of length—giving one-sixteenth inch pitch. It is not correct to refer to 16 pitch, as is frequently done, but always one-sixteenth inch pitch. When one comes to Metric Threads one is saved any confusion, since T.P.I. enters not, and the pitch is always plainly expressed as such in millimetres, thus, 1.5 mm. pitch, 2 mm. pitch, etc., etc.

Thirdly, the angle, which, as already stated, is a set figure for each Standard Thread form, and is 55 deg. in the case of the Whitworth. Measured between any two adjacent and oppositely inclined slopes, it is correctly defined as an "included angle," meaning the number of degrees included between any two given slopes, and not the angle which each makes with the centre line or with the base line.

These are the essentials—these three dimensions, which are given one and need no seeking, and the remainder are the adjuncts thereto.

The more important is the root or core diameter, measured between the base of the grooves left by the threads from one side the screw to the other. As I have shown the depth of the thread in Whitworth form to be 0.64 times the pitch, one needs to deduct twice this amount (one for the depth of thread on each side) from the nominal or outside diameter to obtain the core dimension.

Then one has the mean diameter—which is the pitch diameter—or the effective diameter, a point very difficult to measure without special instruments and gadgets, which, since it lies halfway on the slopes of the threads between peaks and roots, is obviously dimensioned halfway between the maximum or outside and the minimum or core or root diameters. Simplest to arrive at by deducting one depth of thread (the equal of two half-depths), that is 0.64 times the pitch, from the outside diameter.

And, finally, one has the dimension and the form taken by the peak of the thread, and also the shape given to the root of the groove. These are equal in the Whitworth section shown, being each radiused by 0.137 of the pitch, and removing the sharp corners to the extent of 0.16 times the length of the pitch.

Which completes all that need be said of the Whitworth section or outline of thread of itself. In a later paragraph will be given a brief description of, and the uses for, the various schedules of pitches in relation to outside diameters which have been officially adopted for differing purposes.

The British Association Thread.

Turning from Whitworth, one comes to a thread much used in aeroplane work, namely, the B.A. Essentially a small screw thread, it is used for nothing larger than 6 mm., or just under $\frac{1}{4}$ in. Its importance lies in the fact that it serves as a downward continuation of the B.S.F. Thread table, whose smallest size is $\frac{1}{4}$ in. Its two sizes No. 2 and 4 (approximately 3-16ths and $\frac{1}{8}$ in. respectively) in company with the B.S.F. Table from $\frac{1}{4}$ in. to 1 in. form the Standard Screw Schedule of the British Automobile Committee.

The angle of the slopes is $47\frac{1}{2}$ deg., a somewhat odd figure, and the peaks and roots are rounded off by approximately 2/11ths of the pitch, leaving a total depth of thread equal to 0.6 of the pitch. This thread in all its dimensions is based on the Swiss Instrument Standard Thread, but the rounding of the top and bottom have been made uniform instead of differing slightly, as originally designed by Prof. Thury.

All remaining threads, in which one is interested, have for angle the nice round figure of 60 deg., which makes the triangle

equilateral, giving three sides of even length, and each of the three included angles the equal figure of 60 deg.

The United States Standard and the old French Metric are identical in outline, the only difference between them, of course, is that the one is dimensioned in inches and the other in mm.

The height of the 60 deg. triangle is 0.866 times the base, and the peaks and roots are simply flatted by $\frac{1}{8}$ of the pitch length each, leaving 6/8ths or $\frac{3}{4}$ of 0.866, that is 0.6495 times the pitch for the total depth of the thread. The mean or effective diameter is, therefore, the outside size, minus 0.65 times the pitch, and the root or minimum diameter is a similar amount still less.

The flat form of peak and root is considered more facile of production than a rounded one. Certain it is that this form is less trouble to set out owing to the even-figured angle, and the flat peaks look after themselves if the groove is formed the correct depth and shape.

The other Metric thread, the Système International, is that put forward for adoption by all nationals universally. A very laudable object, but one which will await fruition until the Metric system of weights and measures is likewise universally adopted.

In actual form or section the difference from the French Metric outline is simply that the root of the groove is recommended to be allowed a little extra depth for clearance, together with a slightly rounded profile. The peak is flattened, as in the others. The object of the extra depth is to ensure adequate clearance between the same and the flat peak of the counterpart thread when inserted, and, in effect, it does probably allow the other dimensions to be worked much closer to standard size in both the male and female parts without the fear of binding, since in practice it is found that the groove is the first element to go wrong, owing to the cutting edge, which forms it, being the first part of the tool to wear, thus leaving the groove slightly insufficient in depth.

It is much to be regretted that the Congress which recommended the system did not tie this clearance down to definite dimensions, as many people are very hazy as to what is requisite. All the data they gave was a fixed maximum of 1/16th the triangle height, and the form was left optional. However, the officially approved and very general procedure is to round out the groove to a depth of not less than 1/24th, and not more than 1/16th of the triangle height.

A word of warning as to the effect of this haziness in definition. Having no fixed data to go upon, practically all the textbooks give the depth of thread for the S.I. at identically that of the French Metric, which obviously is making no allowance for the extra clearance. In using these tables, therefore, to arrive at core diameters, it is necessary to deduct from the figure given twice the proportion of the pitch which is represented by the clearance adopted.

In producing Metric S.I. Threads, however, provided that the maximum is not exceeded, no great importance attaches to this clearance, since, if the other elements are correctly formed, the male and female screws will assemble satisfactorily, as will the U.S.S. and French Metric, which have no clearance. Any clearance at all will really comply with the recommendations, and, from the standpoint of core strength, obviously the less taken out the better.

Remains only the section of the C.E.I. (Cycle Engineers' Institute) to be dealt with. Adopted originally to cover the need of the cycle trade for interchangeability, this thread is rather shallower in cut than the others, owing to a greater amount rounded off top and bottom, suited for this reason, to screwing very small diameters like wheel spokes, and also very thin steel tube when the thickness of the wall is insufficient to take other standards of depth. The angle is 60 deg., and the profiles rounded one-sixth the pitch. The remaining depth of thread is equal only to 0.5327 of the pitch, and is the shallowest of all that one is called upon to consider.

Technical (2).—Pitches and Diameters.

The bigger in diameter the part to be screwed the deeper can be the section of the thread to be cut thereon, and obviously it is no use to adopt a set outline of thread without laying down also the proportions its dimensions should bear to the various diameters of objects to be screwed. In order to ensure strict interchangeability between different firm's products, it was, therefore, necessary to compile a progressive schedule of pitches to suit the various diameters.

The whole of these schedules which apply to the Aeroplane industry are given in the accompanying tables, which supply adequate data for any thread with which one is likely to meet.*

Thus, for each standard the outside or nominal size is given together with the pitch or number of threads to be cut per inch of length. The angle is stated at the head of each column, with the thread depth and form of top and bottom profile. To render the tables of the utmost service each screw has its core diameter stated, from which, in conjunction with the nominal size, the

Miscellaneous Screw Threads.

British Standard Automobile Threads.

These comprise B.S.F. from $\frac{1}{4}$in. to 1in. with the addition of B.A. Nos. 2 & 4 the dimensions of which will be found in the Tables.

Spark Plug Thread.

Approved form is Metric Thread. Outside Dia. = 18mm. Pitch = 1.5mm. Core =15.89mm.

Photographic Threads.

Approved form Whitworth. 1in. to 3in. Dia., 24 Threads per inch.
over 3in. ,, 12 ,, ,,

Sharp Vee Threads.

Angle as U.S. Standard, but top and bottom left sharp or nearly so. Pitches agree with U.S. Standard up to $3\frac{3}{4}$in. with exception of the $1\frac{5}{8}$in. size.

Wood Screws. Dia. and Threads per inch.

Screw No.	00	0	1	2	3	4	5	6	7
Diameter in.	.06	.063	.066	.08	.094	.108	.122	.136	.15
Threads per 1in.	32	30	28	26	24	22	20	18	16
Screw No.	8	9	10	12	14	16	18	20	
Diameter in.	.164	.178	.192	.22	.248	.276	.304	.332	
Threads per 1in.	14	12	12	10	9	8	$7\frac{1}{2}$	7	

Brass Gas Threads.

Must not be confused with B.S. Pipe. Brass Gas Threads are cut Whit. 26 T.P.I. for all sizes and only apply to the very light tubing used in the Gas Fittings Trade.

* [*N.B.—See Screw Thread Tables on centre pages of this issue.*]

effective diameter, which lies halfway between the two, can readily be ascertained without protracted calculation or formulæ, as also can the depth of any particular thread, since it is half the difference between the nominal and core diameters.

Taking these schedules in their order as printed, a word as to their origin and the purpose each serves should be of interest.

The first is the English Standard Whitworth (E.S.W.) or (S.W.), the original schedule of Sir Joseph Whitworth, which he put forward in conjunction with the Whitworth Section of Thread, and adopted some 70 years back for general engineering purposes. That it was a really admirable one may be gauged from the fact that the U.S. Standard of pitches closely approximates to it. The actual authentic standard covered no size below ¼ in., but the list was later extended to cover the small sizes, which should strictly be referred to as the English Whitworth Small Screw Threads. However, since these were generally accepted in this country along with the schedule proper, they are now regarded as forming part thereof, and distinction is seldom made. This is, however, the reason why many tables are still printed with no mention of sizes below ¼ in. diameter.

Now the Whitworth Standard Thread provides what is known as a fairly coarse screw, where the pitch is large proportionately to the diameter, and being the basis of the other dimensions as has been seen, the resulting screw is rather deep, particularly in the smaller sizes, say from ¼ in. to ⅝ in. Apart from the weakness of the core against tensile stresses, the traverse of the thread is too steep to allow delicate adjustments, nor will nuts under tension remain firm so well as with a finer pitch. For these reasons, although perfectly satisfactory and most generally used on the older kinds of engineering work, it is not greatly in favour for automobile work, and less so in aero-construction.

There are certain particular services, however, where the coarse depth of thread is advantageous, notably in the case of studs or bolts which are to screw into aluminium castings. Here the great grip obtained by the deep thread is desirable, and little note need be taken of the lower tensile strength left in the core, since that of the castings is much lower than the steel screw. The danger is really greater of the threaded hole stripping, that is the whole thread breaking away and pulling out. Whitworth threads are also frequently used where there is no great strain, as in holding detachable aluminium covers and oil pumps and crank-case bottoms, which usually require a large number of small bolts, and where considerable time is saved by the coarser pitch in assembling these, since fewer turns are required to screw the bolts home.

British Standard Fine.

In English aero practice it is the British Standard Fine Thread which is almost universally adopted for general screwed work. Known as the B.S.F., and sometimes called the B.F.T., it was greatly in favour in automobile practice, and its lower sizes, from ¼ in. to 1 in., were recently adopted as standard for car work.

This thread is found on nearly all screws, bolts, pins, nuts, etc., on British-designed machines and engines. The core diameter is of a good strength, as will be seen by comparing the two first of the tables. Take, for instance, the ¼ in. Whit., with its core 0.186 in. The reduction here, from the nominal diameter of 0.250 in., is 25 per cent., whereas the 0.200 in. core of the B.S.F. equals a reduction 20 per cent. only. For 5/16 in. the reduction is 22½ per cent., against 18½ per cent., and for 1 in. Whitworth is 16 per cent. against B.S.F., 12½ per cent.

And here will also be noted an apparent anomaly, common to most screw tables, which is the gradual lessening in the percentage of reduction as we progress to the bigger diameters. This is due to the fact that in large sizes the strength of a coarse screw is nearly identical with that of a finer one, from the point of view of resistance to clean shear. The mean strength of any thread lies at the pitch or effective diameter line, where, in a correctly formed section, the amount of metal removed is exactly equal to the amount remaining, so that at this point the thickness of the one thread is exactly equal to the thickness of the counter-thread which bears against it. There is, therefore, no cause to cut our larger diameters of screw so deep in proportion to the smaller ones, and since the smaller the section of thread cut the less metal to be removed, and therefore the cheaper to produce, and the stronger at the core, the ratio decreases as our outside diameter gets larger. A factor which has to be considered is the number of threads to be given the nut, because this is usually as thick through as the diameter of the male screw, and with too fine a pitch not only would time be wasted in screwing it home, but excessive strain might be set up owing to the great leverage on a fine screw thread.

It should be noted that the 26 T.P.I. for ¼ in. size, B.S.F., is a recent amendment, not correctly given in many printed tables. The old figure was 25.

British Standard Pipe.

The British Standard Pipe Thread (B.S.P.), the next table shown, is a further case where the Whitworth thread outline has been adapted to a special purpose by varying the relation of pitch to cutside diameter.

The necessity for this table lies in the fact that a pipe of large diameter has relatively little metal in the wall on which to cut a screw thread. Take a pipe of 3 in. outside diameter and 2¾ in. bore, the Standard Whitworth and the B.S.F. would both have to be cut deeper than the thickness of metal would accommodate, which is why one has to set up a special table of pitches.

Note a peculiarity in this table. There are only six different pitches to cover all diameters from ⅛ in. to 18 in. inside bore. Apparently extraordinary, but capable of horse sense explanation. The pitch is scarcely governed by the diameter at all, but by the wall thickness, and since the wall thickness over a certain range of diameters is left the same, the pitch of screw can be served likewise.

A second peculiarity is that the gauge size or top diameter of thread is well under the outside diameter of the pipe, the reason being that the male screw on the pipe is intended to be cut on the taper to the extent of 1/16th of an inch for each inch length of thread, the gauge size taken is the centre of this taper and, therefore, greater than the small end and less than the large, which latter is in turn slightly under the outside diameter of the pipe to ensure getting a good thread despite the roughness and error from the circular form usually found in this class of pipe.

And since one does not use common gas piping in the business, unless for shelf racks in the stores, why is this interesting? Well, the standard pipe thread has always been used on the corresponding unions, nipples and nuts, which, unlike the pipes themselves, need not be cut on the taper, and this form of thread was adopted by the automobile trade for its inlet, exhaust, oil and the like pipe unions, and has similarly become attached to the aeroplane trade, since it is decidedly a useful thread on large plugs and collars, such as valve seat collars, cylinder jacket plugs, and like fillings for large openings, since they (the fillers, not the openings) are usually recessed and cut away so as to be light compared with their diameter, and thus generally resemble tube in the section where the thread is wanted.

Considerable use of it is made on parts not in the way of piping, where, from the inherent demand for lightness, the bulk of the metal is cut away to leave only a thin wall on which to cut threads.

Other Threads.

The C.E.I. Table of Threads, as has already been remarked, is designed for strictly special purposes, viz., spokes and their nipples for wheels, extra thin steel tubing, and a few other like sections.

The B.A. thread is one greatly used as a fine pitch thread on turnbuckles and most all screwed parts of diameter less than ¼ in. In its larger sizes, from No. 0 down to No. 10, it will be found to be employed in many places, in fact, in practically all where a small diameter screw is requisite.

The preceding paragraphs have covered most of the threads in general use, and very little need be said of the remainder.

Of metric threads, of course, many examples will be met, due to the great extent to which one used to rely on the French for aero-power units. Since many British firms are turning out numbers of engines to French designs, the tables will be found very useful. There appears to be no special schedule of fine pitch screws in Continental practice, but the metric standards are somewhat less in pitch than Whitworth Standard, and finer threads are seldom required. If they should be called for there would, thanks to the beauty of the metric system of measures, be no great difficulty, since a screw could be cut to any pitch in relation to its diameter, and occasion no confusion if even figures were kept to. Thus a crankshaft of 40 mm. diameter at its end could be screwed 3 or 5 mm. pitch if the standard 4 mm. was not thought suitable. The difference would be easily discernible and would be no trouble to recognise by measuring, much less, anyway, than would be a similar departure from standard in our good old effete system of inches and vulgar fractions thereof.

And since American aeronautics loom large in the eye at the moment, particularly if the eye belongs to some sections of the non-technical press on either side of the pond, some attention should be paid to their two standards of threads. The two tables will be found very closely to approximate in pitch ratio to the English Standard Whitworth and the B.S.F. The one is a coarse thread for general engineering, and the other has the same form of outline, in a finer range of pitches, for automobile work. This latter it is which will be mainly found on those thousands (or is it to be millions?) of super-aerial-dreadnought-Hun-hunters which the lay press fondly imagine, or profess to, are now almost half-way across the Atlantic.

It seemed well to preface these tables with a brief résumé of several miscellaneous threads, which may be met in some channel or other of mechanics aeronautical, and to thus cover in a thorough manner, as befits any subject tackled in this progressive journal, screws and screw threads in their relation to aircraft construction.—V. P. B.

The Aeroplane

Acetylene Welding Plant—

Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—

Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation, Newcastle-on-Tyne."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2 City 7724.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.

Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."

Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."

Martinsyde, Ltd., Brooklands, Byfleet. Woking 331; Byfleet 171. "Martinsyde, Weybridge."

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455 "Nieuscout, Crickle, London."

Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."

The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. Putney 2240-2241, "Carbodis, London."

Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerfyta, Knights, London."

Waring & Gillow, Ltd., Hammersmith. Museum 5000. "Warisen, Ox, London."

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

White, J. Samuel, & Co., Ltd East Cowes. Cowes 3. "White, East Cowes."

Airships—

Airships, Ltd., High Street, Merton. Wimbledon 1314.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, 'Phone, London."

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Bizfibild, London."

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.

The Wilfley Co., Ltd., Salisbury House, London Wall, E.C.2 City 2681-2. "Wrathless, Phone, London."

Cable Coverings and Cable Controls—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Capstan Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Castings (Aluminium, Brass, Bronze, Machined or Rough)—

Coan, R. W., 219, Goswell Road, London, E.C.1 City 3846. "Krankases, Isling, London."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."

London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."

Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."

B. D. V. Aircraft Spares, Syon Chambers, 16a, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—

British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."

British Celluiose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3022. "Ajawb, London."

Clark Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic. London."

Elastic Cords—

Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—

Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. Midland 981. "Fahrenheit, Birmingham."

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—

E. Kalker & Co., Coventry. Coventry 241 "Kalker, Coventry."

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford No. 1. "Pump, Bedford."

Arrol-Johnston, Ltd., Dumfries. Dumfries. 281-182. "Mocar, Dumfries."

The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000.

Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. Gerrard 238. "Beardmore, London."

Dudbridge Iron Works, Ltd. (Salmson), 87, Victoria Street, London, S.W.1. Vic. 7026. "Aeroflight, Vic., London."

Gordon Watney & Co., Ltd., Weybridge. Weybridge 550 (7 lines). "Mercédès, Weybridge."

Green Engine Co., Ltd., Twickenham. Richmond 1293.

Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. Hammersmith 1910. "Gwynne, Hammersmith."

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sturtevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Moorfield, Wolverhampton."

The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W.. Walthamstow 408 (2 lines). "Elevenfold, London."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Flexible Shafts—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Flying Schools—

Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. Bournemouth 1160 "Etches, Winton."

Cambridge School of Flying & Aerodrome Co., Ltd., 30b, St. Andrews Street, Cambridge.

Galvanising—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Cowper-Coles Manufacturing Co., Sunbury-on-Thames. Sunbury 37.

Gears—

Moss Gear Co., Ltd., Thomas Street, Aston, Birmingham. East 407. "Mosgear, Birmingham."

Glue—

Improved Liquid Glues Co., Ltd., Gt. Hermitage Street, E. (Croid.). Avenue 3178. "Excroiden, Wapp, London."

Mendine Co., 8, Arthur Street, E.C. Bank 5873.

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines). "Comyn, Ching, Westcent, London."

Chas. P. Kinnell & Co., Ltd., 65 & 65a, Southwark Street, London, S.E.1. Hop 372 (2 lines). "Kinnell, London."

Instruments—

British Wright Co., Ltd., 33, Chancery Lane, W.C.2. Holborn 1308.

Instruments (Scientific, Altimeters, Speed and Pressure Gauges, etc.)—

Short & Mason, Ltd., Macdonald Road, Walthamstow, E.17. Walthamstow 180. "Aneroid," Phone, London

Machine Tools—

Brewster & Co., 11, Queen Victoria Street, E.C.4. City 768. "Circumfuse, Cannon, London."

Magneto Driving Pieces—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Magnetos—

The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. 1008-1009 Coventry. "Corlton, Coventry."

The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. Museum 430. "Vicksmag, Phone, London."

Metal Manufacturers—

Chas. Clifford & Sons, Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

Metals in General—

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

SCREW THRE

Comp

FOR AERONAUTICAL, AUTOMO

In the following Tables the maximum diameter and core (or root) diameter is given. The effective or pitch diameter i

	Standard Whitworth Threads (S.W.)			British Standard Automobile Threads and British Standard Fine (B.S.F.)		British Standard Pipe (B.S.P.) (or Gas Threads.)			Cycle Engineers Institute (C.E.I.)	
Angle of Thread	55°								60°	
Form of Thread. Top	Radius = Pitch X .1373								Radius = Pitch X .16	
Bottom	Radius ditto								ditto	
Depth of Thread	Pitch X .64033								Pitch X .5327	
Nominal Size.										
Fraction in.	Decimal in.	Size of Hex. across Flats.	Threads per inch.	Core Dia. inch.	T.P.I.	Core Dia. inch.	Gauge Dia. Outside inch.	T.P.I.	Core Dia. inch.	T.P.I.	Core Dia inch.
—	.092	—	—	—	—	—	—	—	—	56	.073
—	.104	—	—	—	—	—	—	—	—	44	.079
1/8	.125	—	40	.0929	—	—	.383	28	.337	40	.098
—	.154	—	—	—	—	—	—	—	—	40	.127
5/32	.1562	—	32	.1162	—	—	—	—	—	—	—
—	.175	—	—	—	—	—	—	—	—	32	.141
3/16	.1875	.440	24	.1341	—	—	—	—	—	32	.154
7/32	.2187	—	24	.1654	—	—	—	—	—	—	—
1/4	.250	.520	20	.186	26	.2007	.518	19	.451	26	.209
—	.266	—	—	—	—	—	—	—	—	26	.225
9/32	.2813	—	—	—	26	.232	—	—	—	26	.240
5/16	.3125	.600	18	.2414	22	.2543	—	—	—	26	.271
3/8	.375	.705	16	.295	20	.311	.656	19	.589	26	.334
7/16	.4375	.815	14	.346	18	.3664	—	—	—	—	—
1/2	.5	.915	12	.3933	16	.4200	.825	14	.734	—	—
9/16	.5625	1.01	12	.4558	16	.4825	—	—	—	20	.509
5/8	.625	1.10	11	.5086	14	.5355	.902	14	.811	—	—
11/16	.6875	1.20	11	.5711	14	.596	—	—	—	—	—
3/4	.75	1.30	10	.6219	12	.6433	1.041	14	.950	—	—
13/16	.8125	1.39	10	.6844	12	.7058	—	—	—	—	—
7/8	.875	1.48	9	.7327	11	.7586	1.189	14	1.098	—	—
1	1.0	1.67	8	.8399	10	.8719	1.309	11	1.193	26	.959
1 1/8	1.125	1.860	7	.942	9	.9827	—	—	—	—	—
1 1/4	1.25	2.05	7	1.067	9	1.1077	1.65	11	1.534	—	—
—	1.290	—	—	—	—	—	—	—	—	24	1.245
—	1.370	—	—	—	—	—	—	—	—	24	1.325
1 3/8	1.375	2.220	6	1.1616	8	1.2149	—	—	—	—	—
1 7/16	1.4375	2.410	6	1.2241	8	1.2774	—	—	—	24	1.393
1 1/2	1.5	2.410	6	1.2866	8	1.3399	1.882	11	1.766	24	1.455
1 5/8	1.625	2.580	5	1.3689	8	1.4649	—	—	—	—	—
1 3/4	1.75	2.760	5	1.4939	7	1.5670	2.116	11	2.000	—	—
2	2.0	3.150	4.5	1.7154	7	1.817	2.347	11	2.231	—	—
2 1/4	2.25	3.550	4	1.9298	6	2.0366	2.587	11	2.471	—	—
2 1/2	2.5	3.890	4	2.1798	6	2.2866	2.960	11	2.844	—	—
2 3/4	2.75	4.180	3.5	2.3841	6	2.5366	3.210	11	3.094	—	—
3	3.0	4.530	3.5	2.6341	5	2.7439	3.460	11	3.344	—	—
3 1/4	3.25	4.850	3.25	2.856	5	2.9939	3.700	11	3.584	—	—
3 1/2	3.5	5.180	3.25	3.106	4.5	3.2154	3.950	11	3.834	—	—
3 3/4	3.75	5.550	3.0	3.3231	4.5	3.4654	4.200	11	4.084	—	—
4	4.00	5.950	3.0	3.5731	4.5	3.7154	4.450	11	4.334	—	—
4 1/4	4.25	—	2.875	3.8046	4	3.9298	—	—	—		
4 1/2	4.5	6.820	2.875	4.0546	4	4.1798	4.950	11	4.834		
4 3/4	4.75	—	2.75	4.2843	4	4.4298	—	—	—		
5	5.00	7.8	2.75	4.5343	4	4.6798	5.450	11	5.334		
5 1/4	5.25	—	2.625	4.7621	3.5	4.8841	—	—	—		
5 1/2	5.5	8.85	2.625	5.0121	3.5	5.1341	5.950	11	5.834		
5 3/4	5.75	—	2.5	5.2377	3.5	5.3841	—	—	—		
6	6.00	10.00	2.5	5.4877	3.5	5.6341	6.450	11	6.334		
							7 to 10 inch.	10 Threads per in.			
							11 to 18	8 Threads per in.			

Note.—The C.E.I. Co plete Table include smaller sizes, viz.: 15, 16 and 17 Imper Wire Gauge, all which are screwed Threads per inch..

ABLES.

BENEDICT.

GENERAL ENGINEERING USE.

ed since it is half of the product of these two figures, the depth of 1 thread likewise equals half the difference between them.

NITED STATES STANDARD (OR SELLERS.)			SOCIETY OF AUTOMOBILE ENGINEERS (AMERICAN) S.A.E.				*SYSTEME INTERNATIONAL (S.I.)		FRENCH STANDARD (METRIC.)		BRITISH ASSOCIATION, B.A				
60° Flat = Pitch X .125 Flat = ditto Pitch X .6495							60° Flat = Pitch X .125 *Rounded = ditto (see note.) Pitch X .6495		60° Flat = Pitch X .125 Flat = ditto Pitch X .6495		47° 30′ Radius = Pitch X .1818 ditto ditto Pitch X 6				
cross ts.	T.P.I.	Core Dia. inch.	Hex across Flats.	T.P.I.	Core Dia. inch.	Outside Dia. mm.	Pitch mm.	Core Dia.	Pitch mm.	Core Dia.	B.A. No.	Outside Dia. inches	Pitch mm.	Pitch inches.	Core Dia mm.
–	—	—	—	—	—	1.7	—	—	—	—	10	.0669	.35	.0138	1.28
–	40	.925	—	—	—	1.9	—	—	—	—	9	.0748	.39	.0154	1.43
–	—	—	—	—	—	2.2	—	—	—	—	8	.0866	.43	.0169	1.68
–	—	—	—	—	—	2.5	—	—	—	—	7	.0984	.48	.0189	1.92
–	36	.1202	—	—	—	2.8	—	—	—	—	6	.1102	.53	.0209	2.16
–	—	—	—	—	—	3.0	.55	2.29	.5	2.35	—	—	—	—	—
–	32	.1469	—	—	—	3.2	—	—	—	—	5	.126	.59	.0232	2.49
–	28	.1724	—	—	—	3.6	—	—	—	—	4	.1417	.66	.0260	2.81
	20	.185	.437	28	.2036	4.0	.7	3.09	.75	3.03	—	—	—	—	—
–	—	—	—	—	—	4.1	—	—	—	—	3	.1614	.73	.0287	3.22
–	—	—	—	—	—	4.7	—	—	—	—	2	.185	.81	.0319	3.728
5	18	.2403	.5	24	.2584	5.0	.85	3.90	.75	4.03	—	—	—	—	—
7	16	.2938	.562	24	.3209	5.3	—	—	—	—	1	.2087	.9	.0354	4.22
1	14	.3447	.625	20	.3725	6.0	1.0	4.70	1.0	4.70	0	.2362	1.0	.0394	4.8
5	13	.4002	.75	20	.435	7.0	1.0	5.70	1.0	5.70	—	—	—	—	—
0	12	.4543	.875	18	.4903	8.0	1.25	6.38	1.0	6.70	—	—	—	—	—
	11	.5069	.937	18	.5528	9.0	1.25	7.38	1.0	7.70	—	—	—	—	—
	—	—	1.0	16	.6063	10.0	1.5	8.05	1.5	8.05	—	—	—	—	—
	10	.6201	1.062	16	.6688	11.0	1.5	9.05	—	—	—	—	—	—	—
	—	—	—	—	—	12.0	1.75	9.73	1.5	10.05	—	—	—	—	—
7	9	.7308	1.250	14	.7822	14.0	2.0	11.40	2.0	11.40	—	—	—	—	—
5	8	.8376	1.437	14	.9072	16.0	2.0	13.40	2.0	13.40	—	—	—	—	—
2	7	.9394	1.625	12	1.017	18.0	2.5	14.75	2.5	14.75	—	—	—	—	—
0	7	1.064	1.812	12	1.142	20.0	2.5	16.75	2.5	16.75	—	—	—	—	—
	—	—	—	—	—	22.0	2.5	18.75	2.5	18.75	—	—	—	—	—
	—	—	—	—	—	24.0	3.0	20.10	3.0	20.10					
7	6	1.158	2.00	12	1.267	26.0	—	—	3.0	22.10					
	—	—	—	—	—	27.0	3.0	23.10	—	—					
5	6	1.283	2.187	12	1.392	28.0	—	—	3.0	24.10					
2	5.5	1.389	—	—	—	30.0	3.5	25.45	3.5	25.45					
	5	1.490	—	—	—	32.0	—	—	3.5	27.45					
1	4.5	1.711	—	—	—	33.0	3.5	28.45	—	—					
5	4.5	1.961	—	—	—	34.0	—	—	3.5	29.45					
8	4.0	2.175	—	—	—	36.0	4.0	30.80	4.0	30.80					
2	4.0	2.425	—	—	—	38.0	—	—	4.0	32.80					
6	3.5	2.6289	—	—	—	39.0	4.0	33.80	—	—					
0	3.5	2.8788				40.0	—	—	4.0	34.80					
3	3.25	3.1003				42.0	4.5	36.15	4.5	36.15					
7	3	3.317				44.0	—	—	4.5	38.15					
1	3	3.567				45.0	4.5	39.15	—	—					
5	2.875	3.7982				46.0	—	—	4.5	40.15					
8	2.75	4.0276				48.0	5.0	41.51	5.0	41.51					
2	2.625	4.2551				50.0	—	—	5.0	43.51					
6	2.5	4.4804				52.0	5.0	45.51	—	—					
0	2.5	4.7304				56.0	5.5	48.86	—	—					
3	2.375	4.9530				60.0	5.5	52.86	—	—					
7	2.375	5.2030				64.0	6.0	56.21	—	—					
1	2.25	5.4226				68.0	6.0	60.21	—	—					
						72.0	6.5	63.56	—	—					
						76.0	6.5	67.56	—	—					
						80.0	7.0	70.91	—	—					

B.A. Nos. 11 to 25 are omitted, being too small to be called for

*NOTE.—SYSTEME INTERNATIONAL. The form of this thread is identical with that of the U.S. Standard and the French Metric, with the additional provision of a clearance at the root or core of the thread. The outline given to the root of the thread to provide this clearance is optional, but clearance is not to exceed 1/16th of the height of the theoretical triangle formed by the slopes of the thread. A rounded profile recommended by the International Congress is generally that adopted by manufacturers. The figures given in the tables for depth of thread and core diameters are the theoretical dimensions without allowance for this clearance.

SCREW THREADS.

Compiled by BENEDICT.

FOR AERONAUTICAL, AUTOMOBILE & GENERAL ENGINEERING USE.

In the following Tables the maximum diameter and core (or root) diameter is given. The effective or pitch diameter is exactly midway between them, and as it is half of the product of these two figures, the depth of 1 thread likewise equals half the difference between them.

Angle of Thread / Form of Thread. Top / Bottom / Depth of Thread	Standard Whitworth Threads (S.W.)			British Standard Automobile Threads and British Standard Fine (B.S.F.)		British Standard Pipe (B.S.P.) (or Gas Threads.)			Cycle Engineers Institute (C.E.I.)	
	55° Radius = Pitch X .1878 Radius ditto Pitch X .64033								60° Radius = Pitch X .166 ditto Pitch X .5327	
Nominal Size. Fraction in.	Nominal Size. Decimal in.	Size of Hex. across Flats.	Threads per inch.	Core Dia. inch.	T.P.I.	Core Dia. inch.	Gauge Dia. Outside inch.	T.P.I.	Core Dia. inch.	T.P.I.	Core Dia. inch.
—	.092	—	—	—	—	—	—	—	—	56	.073
—	.104	—	—	—	—	—	—	—	—	44	.0798
1/8	.125	—	40	.0929	—	—	.383	28	.337	40	.0984
—	.154	—	—	—	—	—	—	—	—	40	.1274
5/32	.1562	—	32	.1162	—	—	—	—	—	—	—
—	.175	—	—	—	—	—	—	—	—	32	.1417
3/16	.1875	.440	24	.1341	—	—	—	—	—	32	.1542
7/32	.2187	—	24	.1654	—	—	—	—	—	—	—
1/4	.250	.520	20	.186	26	.2007	.518	19	.451	26	.2091
—	.266	—	—	—	—	—	—	—	—	26	.225
9/32	.2813	—	—	—	26	.232	—	—	—	26	.240
5/16	.3125	.600	18	.2414	22	.2543	—	—	—	26	.2715
3/8	.375	.705	16	.295	20	.311	.656	19	.589	26	.3341
7/16	.4375	.815	14	.346	18	.3664	—	—	—	—	—
1/2	.5	.915	12	.3933	16	.4200	.825	14	.734	—	—
9/16	.5625	1.01	12	.4558	16	.4825	—	—	—	20	.5092
5/8	.625	1.10	11	.5086	14	.5335	.902	14	.811	—	—
11/16	.6875	1.20	11	.5711	14	.596	—	—	—	—	—
3/4	.75	1.30	10	.6219	12	.6433	1.041	14	.950	—	—
13/16	.8125	1.39	10	.6844	12	.7058	—	—	—	—	—
7/8	.875	1.48	9	.7327	11	.7586	1.189	14	1.098	—	—
1	1.0	1.67	8	.8399	10	.8719	1.309	11	1.193	26	.959
1 1/8	1.125	1.860	7	.942	9	.9827	—	—	—	—	—
1 1/4	1.25	2.05	7	1.067	9	1.1077	1.65	11	1.534	—	—
—	1.290	—	—	—	—	—	—	—	—	24	1.2456
—	1.370	—	—	—	—	—	—	—	—	24	1.3256
1 3/8	1.375	2.220	6	1.1616	8	1.2149	—	—	—	—	—
1 7/16	1.4375	2.410	6	1.2241	8	1.2774	—	—	—	24	1.393
1 1/2	1.5	2.410	6	1.2866	8	1.3399	1.882	11	1.766	24	1.4556
1 5/8	1.625	2.580	5	1.3689	8	1.4649	—	—	—	—	—
1 3/4	1.75	2.760	5	1.4939	7	1.5670	2.116	11	2.000	—	—
2	2.0	3.150	4.5	1.7154	7	1.817	2.347	11	2.231	—	—
2 1/4	2.25	3.550	4	1.9298	6	2.0366	2.587	11	2.471	—	—
2 1/2	2.5	3.890	4	2.1798	6	2.2866	2.960	11	2.844	—	—
2 3/4	2.75	4.180	3.5	2.3841	6	2.5366	3.210	11	3.094	—	—
3	3.0	4.530	3.5	2.6341	5	2.7439	3.460	11	3.344	—	—
3 1/4	3.25	4.850	3.25	2.856	5	2.9939	3.700	11	3.584	—	—
3 1/2	3.5	5.180	3.25	3.106	4.5	3.2154	3.950	11	3.834	—	—
3 3/4	3.75	5.550	3.0	3.3231	4.5	3.4654	4.200	11	4.084	—	—
4	4.00	5.950	3.0	3.5731	4.5	3.7154	4.450	11	4.334	—	—
4 1/4	4.25	—	2.875	3.8046	4	3.9298	—	—	—	—	—
4 1/2	4.5	6.820	2.875	4.0546	4	4.1798	4.950	11	4.834	—	—
4 3/4	4.75	—	2.75	4.2843	4	4.4298	—	—	—	—	—
5	5.00	7.8	2.75	4.5343	4	4.6798	5.450	11	5.334	—	—
5 1/4	5.25	—	2.625	4.7621	3.5	4.8841	—	—	—	—	—
5 1/2	5.5	8.85	2.625	5.0121	3.5	5.1341	5.950	11	5.834	—	—
5 3/4	5.75	—	2.5	5.2377	3.5	5.3841	—	—	—	—	—
6	6.00	10.00	2.5	5.4877	3.5	5.6341	6.450	11	6.334	—	—
							7 to 10 inch.	10 Threads per in.			
							11 to 18	8 Threads per in.			

NOTE.—The C.E.I. Complete Table includes smaller sizes, viz.: the 15, 16 and 17 Imperial Wire Gauge, all of which are screwed to Threads per inch.

Angle of Thread / Form of Thread. Top / Bottom / Depth of Thread	United States Standard (or Sellers.)	Society of Automobile Engineers (American) S.A.E.				*Système International (S.I.)		French Standard (Metric.)		British Association, B.A.				
	60° Flat = Pitch X .125 Flat = ditto Pitch X .6495					60° Flat = Pitch X .125 *Rounded = ditto (see note.) Pitch X .6495		60° Flat = Pitch X .125 Flat = ditto Pitch X .6495		47° 30′ Radius = Pitch X .1818 ditto ditto Pitch X 6				
Nominal Size. Fraction in.	T.P.I.	Core Dia. inch.	Hex across Flats.	T.P.I.	Core Dia. inch.	Outside Dia. mm.	Pitch mm.	Core Dia.	Pitch mm.	Core Dia.	B.A. No.	Outside Dia. inches	Pitch mm.	Pitch inches.	Core Dia mm.
1/4	—	—	—	—	—	1.7	—	—	—	—	10	.0669	.35	.0138	1.28
5/16	40	.925	—	—	—	1.9	—	—	—	—	9	.0748	.39	.0154	1.43
3/8	—	—	—	—	—	2.2	—	—	—	—	8	.0866	.43	.0169	1.68
7/16	—	—	—	—	—	2.5	—	—	—	—	7	.0984	.48	.0189	1.92
1/2	36	.1202	—	—	—	2.8	—	—	—	—	6	.1102	.53	.0209	2.16
9/16	—	—	—	—	—	3.0	.55	2.29	.5	2.35	—	—	—	—	—
5/8	32	.1469	—	—	—	3.2	—	—	—	—	5	.126	.59	.0232	2.49
11/16	28	.1724	—	—	—	3.6	—	—	—	—	4	.1417	.66	.0260	2.81
3/4	20	.185	.437	28	.2036	4.0	.7	3.09	.75	3.03	—	—	—	—	—
13/16	—	—	—	—	—	4.1	—	—	—	—	3	.1614	.73	.0287	3.22
7/8	—	—	—	—	—	4.7	—	—	—	—	2	.185	.81	.0319	3.728
15/16	18	.2403	.5	24	.2584	5.0	.85	3.90	.75	4.03	—	—	—	—	—
1	16	.2938	.562	24	.3209	5.3	—	—	—	—	1	.2087	.9	.0354	4.22
1 1/8	14	.3447	.625	20	.3725	6.0	1.0	4.70	1.0	4.70	0	.2362	1.0	.0394	4.8
1 1/4	13	.4002	.75	20	.435	7.0	1.0	5.70	1.0	5.70	—	—	—	—	—
1 3/8	12	.4543	.875	18	.4903	8.0	1.25	6.38	1.0	6.70	—	—	—	—	—
1 1/2	11	.5069	.937	18	.5528	9.0	1.25	7.38	1.0	7.70	—	—	—	—	—
1 5/8	—	—	1.0	16	.6063	10.0	1.5	8.05	1.5	8.05	—	—	—	—	—
1 3/4	10	.6201	1.062	16	.6688	11.0	1.5	9.05	—	—	—	—	—	—	—
1 7/8	—	—	—	—	—	12.0	1.75	9.73	1.5	10.05	—	—	—	—	—
2	9	.7308	1.250	14	.7822	14.0	2.0	11.40	2.0	11.40	—	—	—	—	—
2 1/4	8	.8376	1.437	14	.9072	16.0	2.0	13.40	2.0	13.40	—	—	—	—	—
2 1/2	7	.9394	1.625	12	1.017	18.0	2.5	14.75	2.5	14.75	—	—	—	—	—
2 3/4	7	1.064	1.812	12	1.142	20.0	2.5	16.75	2.5	16.75	—	—	—	—	—
3	—	—	—	—	—	22.0	2.5	18.75	2.5	18.75	—	—	—	—	—
3 1/4	6	1.158	2.00	12	1.267	24.0	3.0	20.10	3.0	20.10					
3 1/2	—	—	—	—	—	26.0	—	—	3.0	22.10					
3 3/4	6	1.283	2.187	12	1.392	27.0	3.0	23.10	—	—					
4	5.5	1.389	—	—	—	28.0	—	—	3.0	24.10					
4 1/4	5	1.490	—	—	—	30.0	3.5	25.45	3.5	25.45					
4 1/2	4.5	1.711	—	—	—	32.0	—	—	3.5	27.45					
4 3/4	4.5	1.961	—	—	—	33.0	3.5	28.45	—	—					
5	4.0	2.175	—	—	—	34.0	—	—	3.5	29.45					
5 1/4	4.0	2.425	—	—	—	36.0	4.0	30.80	4.0	30.80					
5 1/2	3.5	2.6289	—	—	—	38.0	—	—	4.0	32.80					
5 3/4	3.5	2.8788				39.0	4.0	33.80	—	—					
6	3.25	3.1003				40.0	—	—	4.0	34.80					
6 1/4	3	3.317				42.0	4.5	36.15	4.5	36.15					
6 1/2	3	3.567				44.0	—	—	4.5	38.15					
6 3/4	2.875	3.7982				45.0	4.5	39.15	—	—					
7	2.75	4.0276				46.0	—	—	4.5	40.15					
7 1/4	2.625	4.2551				48.0	5.0	41.51	5.0	41.51					
7 1/2	2.5	4.4804				50.0	—	—	5.0	43.51					
7 3/4	2.5	4.7304				52.0	5.0	45.51	—	—					
8	2.375	4.9530				56.0	5.5	48.86	—	—					
8 1/4	2.375	5.2030				60.0	5.5	52.86	—	—					
8 1/2	2.25	5.4226				64.0	6.0	56.21	—	—					
						68.0	6.0	60.21	—	—					
						72.0	6.5	63.56	—	—					
						76.0	6.5	67.56	—	—					
						80.0	7.0	70.91	—	—					

B.A. Nos. 11 to 25 are omitted, being too small to be called for

*NOTE.—SYSTEME INTERNATIONAL. The form of this thread is identical with that of the U.S. Standard and the French Metric, with the additional provision of a clearance at the root or cote of the thread. The outline given to the root of the thread to provide this clearance is optional, but clearance is not to exceed 1/16th of the height of the theoretical triangle formed by the slopes of the thread. A rounded profile recommended by the International Congress is generally that adopted by manufacturers. The figures given in the tables for depth of thread and core diameters are the theoretical dimensions without allowance for this clearance.

Buyers' Guide.

etal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."
Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."
Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2297.
Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041. "Bayliss, Wolverhampton."
The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow, London. Hounslow 254. "Golshel, Hounslow."
Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. Museum 70. "Installing, Eusroad, London."
Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261. "Fremo, Birmingham."
Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."
Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

etal Shearing Tools—

Montgomery, Smith & Co., Ltd., Tangent Works, Keynsham, near Bristol. Keynsham 21. "Ingenuity, Salford."

etal Spinnings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

etric Bolts—

Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

iscellaneous—

Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."
Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C. Central 3731.
Bowdon Wire, Ltd., Willesden Junction. Willesden 2400 (3 lines). "Bowirelim, Harles, London."
Brown Bros., Ltd., Great Eastern Street, E.C.1. London Wall 6300. "Imbrowned, Bethroad, London."
Edison Swan Electric Co., Ponder's End. (Lamps). Enfield 520 (6 lines). "Ediswan, Enfield."
Herbert Frood Co., Ltd., Chapel-en-le-Frith. Central 793. "Frodobrake, Birmingham."
Glasso Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.
London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

lotor Cars—

Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
Standard Motor Car Co., Coventry. Coventry 530 (4 lines). "Flywheel, Coventry."

bservation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

ackers, Shippers, Etc.—

Lep Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depolep, London."

atent Agents—

King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.
Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.
Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

etrol Storage (Bulk)—

Bywater & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. Gerrard 2220. "Bywaterist, London."

iston Rings—

British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—

Bliss, E. W., Co., 2a, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissdon, London."

Presswork—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."
Integral Propeller Co., Ltd., Hendon 9. Kingsbury 104. "Aviprop, Hyde, London."
Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."
Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Stanley Aviation Co, 67, Kingsland Road, E.2. City 8347.
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—

C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. Chapeltown 474. "Instrument, Leeds."

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The Norman Thompson Flight Co., Ltd., Middleton, Bognor Bognor 48. "Soaring, Bognor."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Short Bros., Rochester. Chatham 627. "Seaplanes, Rochester."
Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Shackles—

The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. Hounslow 254. "Golshel, Hounslow."

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.
Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sheet Metal Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Shock Absorbers (Elastic Cord)—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—

Forward Motor Co., Summer Row, Birmingham. Central 6259.
Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.
Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."
Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—

Dart Spring Co., West Bromwich. West Bromwich 322. "Dart, West Bromwich."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—

Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."
Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—

Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—

John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.
James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London."
R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."
The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Weskent."

Varnishes—

Clark R. Ingham, & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."
Harland, W., & Son, Merton. Wimbledon 45.
Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."
Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Washers—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Watchmakers and Jewellers (Silver Models)—

Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—

Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."
London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—

Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wiremill, Musselburgh."
Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Wirework—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Woodworking Machinery—

Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."
Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."
Wadkin & Co., Leicester. Leicester 3614. "Woodworker, Leicester."

The Production of Aeroplanes and their Components

(Twelfth Instalment.)

BY STEPNEY BLAKENEY.

The Tail Plane.

The tail plane will now have to be considered. For the purpose of this article one may assume that the tail plane is almost semi-circular in shape and that the framework is formed of light steel tubing. This will be in four lengths; the first piece being straight, and forming the base or trailing edge of the plane, two pieces of tube forming quarters of a circle on each side, and one piece forming the centre portion of the leading edge, nearly straight.

It may be assumed that the diameter of the tube is about $\frac{5}{8}$ in., and that it is about 20 gauge. All joints have an internal liner pinned in position and brazed.

This, of course, must be well done, and although the oxy-acetylene blowpipe is a delightful instrument to do brazing with, it may be just as well to point out to all concerned that its use for brazing is not allowed by the A.I.D. Of course, there may be exceptions to the rule, but these exceptions apply to special circumstances, which I do not propose to deal with here.

Gas Brazing.

Therefore, one has to resort to the gas blowpipe, of which there are many makes. Those made by the well-known Warrington firm of Fletcher Russell and Co. may be relied upon to do good work, and for this light work an $\frac{1}{2}$-in. gas blowpipe is ample if a good supply of air and gas is obtainable. Some soft brass wire, or brazing strip, should be obtained, and although borax forms a very good flux, some of the brazing compounds now on the market are preferable, and in my opinion better results are obtainable.

Having prepared the semi-circular portions of the tail plane and tested the radii in a jig, these may be taken to the brazing hearth and the joints brazed and cleaned off. After the brazing is complete do not do as I once saw done, cool off with water. It is decidedly bad practice. Let the job cool itself.

Junction Pieces.

The next parts to put onto the semi-circular portion of the tube will be the right-angled junction pieces, which are specially-made steel tube fittings, for forming the connection with the straight tube composing the trailing edge of the tail plane. These will be pinned and brazed, or, as an alternative, sweated on with tinman's solder, after the semi-circular tube ends have been accurately cut to length.

Before this is done, however, slide on, into their respective positions, the hinge fittings for the elevator flaps, which have been milled and bored out of solid bar steel. The position of these hinge fittings involves working to the very finest limits of dimensions, and the greatest possible care must be taken to check their position before finally drilling, pinning, riveting and sweating them into position.

It is certainly most essential that a steel jig be first made and accurately checked and passed by the A.I.D., and used afterwards to locate the fittings accurately whilst being fixed.

Unless these precautions are taken, the tail plane will probably not fit standardised elevators, which may be made by another contractor, and will involve endless trouble to all.

Before fixing the straight tube into the right-angled junction pieces it may be as well to try the ribs of the tail plane in their respective positions, in case any special adjustment of lengths is necessary. This having been done, the straight tube may be finally fixed and the ribs, which are of box-section sheet steel, afterwards fixed and riveted into position, when the wooden stringer, which lies parallel with the trailing edge, has been passed through them. This work being done, the tail plane is complete except, of course, for the covering with fabric and doping.

Tail Ribs.

Having got so far it may be as well to give some idea of the construction of the ribs and of the method and design for a steel jig for making them.

The ribs, one can assume, are made of box-section sheet steel with suitable lightening holes, the steel being 24 gauge.

The first thing to do will be to make a steel former of bar steel about $\frac{3}{8}$-in. thick, less twice the gauge of the steel in thickness, and precisely the same length. The next thing to do is to cut out one of the steel blanks, out of which the ribs will be made, adding to the width the turn up all round to form the flange, plus the turn in, which will be about $\frac{3}{8}$ in. wide.

Having done this, lay the steel former on the blank of steel sheet and carefully locate it all ways in the centre. Then mark off the bolt holes previously drilled in the former, where the lightening holes come in the rib, and drill these holes in the steel blank. (See Fig. 17.) These two holes, in the former and the sheet steel blank, are for the purpose of temporarily fixing bolts to pass through and to hold the steel blank rigidly in position whilst being flanged on the former.

Before proceeding further, it will be necessary to make a female former in halves out of steel bar to fit on the partially-formed rib when the first portion of the flange all round has been turned up. This female former is for the purpose of preventing the steel rib from buckling when the last operation of flanging is being carried out.

A Composite Former.

As the first steel former could not be removed from the rib when all the flanging is completed, it must now be removed and replaced with a similar former made in five pieces (see Fig 17a). This being made in five pieces with the three centre pieces, Nos. 2, 3, and 4 removable, it is easy to see that when the double flanging is complete the work may be removed from the bench vice and the centre pieces removed. Then the two long outer strips, 1 and 5, can easily be removed from the rib.

PLAN OF INNER STEEL FORMER

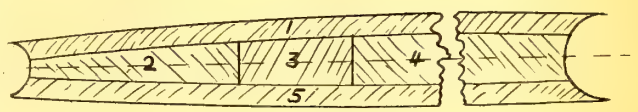


FIG. 17A

What remains then to be done is to mark off and cut out the lightening holes and finish up with a smooth file. Examine the finished ribs and make good any buckle, or defects, that may be observed.

Assembling.

After this the vertical sheet-steel web-stiffeners may be riveted in position to prevent the web from buckling under load. This having been done, the rib may be examined, and, if passed, sent to the A.I.D. After which it may, with the others, which are of varying lengths, be assembled in the framework of the steel tube, thus forming the entire frame of the tail plane when riveted and sweated into position.

The method of rib making, above described, has given most satisfactory results in actual practice, and may be relied on generally. The trouble of making the steel formers is very quickly paid for owing to the speed and accuracy of production, as they permit of moderately-skilled workers being employed.

(To be continued.)

PLAN SHEWING RIB IN STEEL FORMER

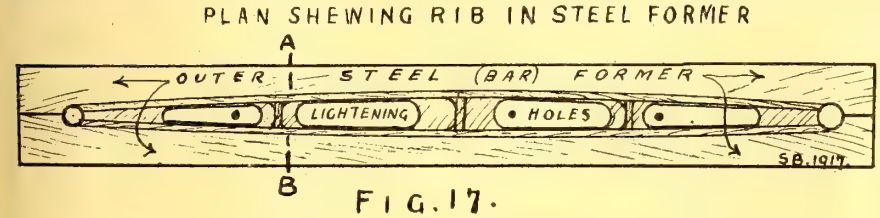
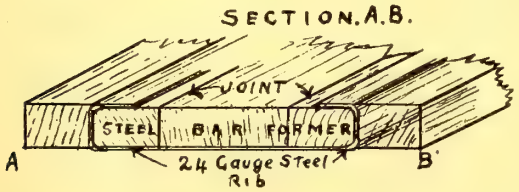


FIG. 17.

SECTION A.B.



A PROSPECTUS RECEIVED.

The prospectus of the "Dutton Aircrafts'" School of Flying, of Sealand, Chester, has come to hand. This brochure sets forth the advantages claimed for the school by its proprietors, and those interested are invited to apply for a copy to the above address.

THE PATENTS INDEX.

The subjoined list of recent inventions has been specially compiled by The Aeroplane from the current Official Patents Records.

Patent Applications.

Adams, W. C. Safety and stability of aircraft while flying. No. 12195. August 25th.

Bourke, A. M. Anti-aircraft guns. No. 12183. August 24th.

British and Colonial Aeroplane Co. Aircraft fuselages. No. 12059. August 22nd.

British and Colonial Aeroplane Co. Engines for aircraft. No. 12060. August 22nd.

British and Colonial Aeroplane Co. Internal combustion engines. No. 12061. August 22nd.

Caplen, G. Aeroplanes. No. 12156. August 24th.

Cleathero, T. H. Tanks for aircraft, etc. No. 11933. August 20th.

Clifford, I. Levels for aircraft. No. 12087. August 23rd.

Doyle, D. Destroying apparatus for use against air and sea craft. No. 12217. August 24th.

Galle, V. P. Flying machines. No. 12025. August 21st.

Harvey, T. Means for communicating from one vessel, or aircraft, to another vessel which is submerged. No. 12051. August 22nd.

Holle, A. A. Aeroplanes. No. 11982. August 21st.

Huddleston, F. Automatic self-directing apparatus for marine and aerial destroyer torpedoes. No. 12193. August 25th.

Jackson, A. J. Projectile device for destruction of aircraft, etc. No. 12145. August 24th.

Mayrow, J. J. Aeronautical machines. No. 12113. August 23rd.

Meikle, G. S. M. Aerial and flat height and distance finder. No. 12223. August 25th.

Piccolomini, H. C. Pontet-. Spars, etc., for aircraft, etc. No. 11902. August 20th.

Rayner, E. S. Anti-aircraft gun mountings. No. 11925. August 20th.

Richinson, A. Method for discovering and signalling approach of airships and means of destroying them. No. 11965. August 21st.

Ring, J. Indicating-instruments for use on aircraft. No. 11951. August 20th.

Robinson, H. M. Projection and propulsion of aerial torpedoes. No. 11979. August 21st.

Ross, C. B. Propellers or tractors for use in air or water. No. 11942. August 20th.

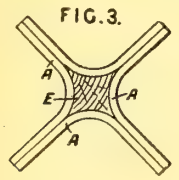
Complete Specification Accepted, prints of which can be obtained on and after September 13th, 1917.

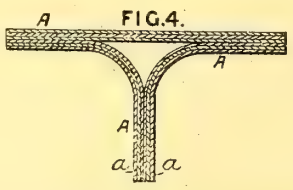
108,694. July 11th, 1916. Frost, C. R. B., and Thorne, G. Internal-combustion engines, more especially such as are used on aircraft.

Abridgments of recently published Specifications.

107,444. Girders, Stays, Joists, etc. Rutherford, H., Little Haugh, Banstead, Surrey.

Strong light stays, joists, girders, and the like, of ply-wood, are formed by combining two or more sheets or strips A, one or more of which is bent, to form stays and the like of X, T,

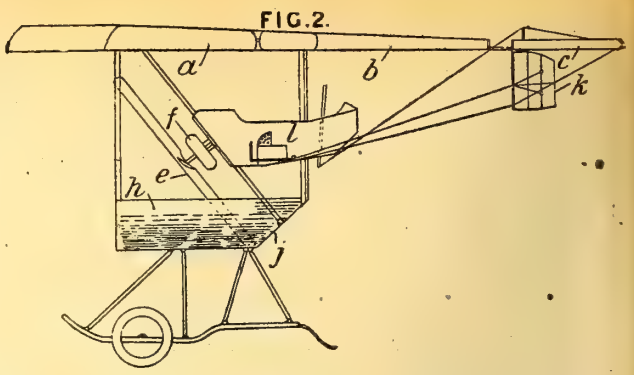




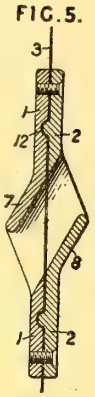
H, O, square, triangular or like section, the flanges or sides *a* of the sheets being secured by adhesives, rivets, or other metallic attachments. Central spaces such as E, Fig. 3, may be filled with pieces of wood or other material.

107,471. Aeronautics. Allan, A., 42, Cambridge Gardens, Leith, Edinburgh.

Aerial Machines without Aerostats; Planes, arrangement and construction of; propelling; steering and regulating altitude.—The airscrew *e* is placed in an inclined position under the plane *a*, *b* and above a curved scoop *h* closed by an inclined end *j*. The air acted upon by the screw is thrown against the plane above, and a partial vacuum is produced in the scoop which is therefore lifted and propelled by the air pressure on the bottom



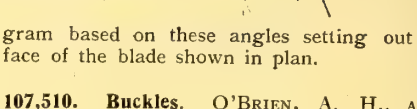
and end. The airscrew is driven by an engine or engines *f* which may be placed below or behind the scoop and may drive the screw shaft by a chain or bevel gear. The plane *a*, *b* may be cruciform in plan, and the longitudinal portion *b* of the plane may be curved in cross-section. Vertical and horizontal rudders *k*, *c* are provided at the rear of the plane and are controlled by wires from a car *l*. An auxiliary elevator may be provided in front of the scoop or on the front of the plane, and an additional car may be arranged behind the scoop. According to the Provisional Specification, the engine may be carried inside the scoop and the vertical rudder is fixed behind the scoop.



107,509. Aeronautics. Aeronautical Instrument Co., and Brewer, G., 33, Chancery Lane, London.

Aerostats.—The operating-cord of a valve or ripping-patch is passed through a fair-lead composed of two similar plates 1, 2 secured together so as to clamp the fabric 3 of the aerostat between them, the two plates leaving passage-ways which form a continuous oblique channel at the required angle to the envelope. Lips 7, 8 are formed on the plates to increase the length of the passage. The two plates have flat surfaces, or an annular projection 12 may be formed on one plate to press the fabric into a corresponding groove in the other plate, or each plate may have a cord laid in one of them. The space between the operating-cord and the passage-way is normally closed by a cork.

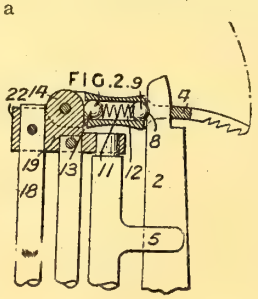
107,519. Screw Propellers. Garscadden, T. D., 139, Meadow Lane, Loughborough, and Boyne, W. K., Damhead Cottage, Kincorth, Bridge of Dee, Aberdeen.



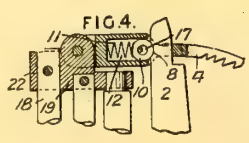
The Specification describes means for determining the pitch angles of a propeller corresponding to different radii and from a diagram based on these angles setting out the effective working face of the blade shown in plan.

107,510. Buckles. O'Brien, A. H., and O'Brien, S., 68½, Curzon Street, Leicester.

a



In a readily releasable fastening for aviators, belts comprising a pivoted catch 4 for retaining a pivoted bar 2 of the buckle in engagement with the prongs 5, the catch 4 is held against accidental displacement by a spring-pressed ball 9, Fig. 2, or roller 10, Fig. 4, which engages a recess 8 in the bar 2. The ball or roller and controlling spring 11 are contained in a hollow portion 12 of the catch, the spring being disposed between the roller 10 and the inner wall of the cavity 12, Fig. 4, or between the ball 9 and a second ball 13, Fig. 2. When the catch is lifted, it is prevented from falling by the engagement of the ball 13 with a lug 14 to which the catch is pivoted. The roller 10 may work on a pin 17 fixed in the catch, as shown, or the pin may work in slots in the sides of the catch. The rear bar 18 of the buckle on which the tubular end of the belt is threaded is secured removably in sockets 22 in the end bars 19.



MARKET REPORTS.

Prices given are for quantities on usual terms.

August 30th, 1917.

COPPER.—The chief interest still centres round the conditions ruling in America. The position there, however, is still very uncertain. The U.S. Government have not yet fixed the prices at which metal must be sold to them, and the delay is causing the market to be very unsettled.

The latest news received from U.S.A. states that the strikes are not yet settled, and the effect upon output is very disastrous in consequence. There is every indication that there will be a serious shortage of refined material.

Prices here continue unaltered. One cannot, however, refrain from thinking that the officials will be compelled to make a further reduction in the prices ruling at present.

Current Prices.

Standard Copper	£120 per ton Cash.
Copper Sheet	£160 per ton.
Copper Tube, S.D.	19¾d. per lb.
Brass Sheet, 24 Gauge	15⅞d. per lb.
Brass Tube, S.D.	16½d. per lb.

TIN.—This market is at present in a very dull condition, although prices at present continue to favour buyers. It is, however, surprising to learn that there does not appear to be a rush to cover future demands. There appears to be ample supplies available.

Comparison of Prices.

August 29th	£242	10	0
August 24th	240	10	0
August 22nd	242	0	0
Last Month	243	5	0
Highest Price, 1916	205	0	0

LEAD.—Supplies for national requirements are well maintained, although there is a feeling that the effect of the recent strikes will shortly be felt. Prices here continue unchanged.

Official Prices.

Virgin Pig Lead	£29 per ton, Ex Ship.
Virgin Pig Lead	£30 per ton, Ex Store.
Sheet Lead	£39 10s. per ton, Deld. U.K.
Lead Pipes	£40 per ton, Deld. U.K.

STEEL.—Supplies continue to be the dominating factor, and the only security appears to be for consumers to look a long way ahead. It is expected that by the end of the year the output will be equal to the demand. This remains to be seen. The aircraft manufacturers' requirements continue to climb to heights beyond the expectation of the greatest optimist. At the same time one must admit that tremendous exertions are being put forth by the steel makers.

Prices still continue unchanged, and there does not appear to be any reason to expect an alteration at present.

Current Prices.

R.A.F., 1E Steel, 36s. to 40s. per cwt., Basis. (Black or Blue Reeled.)	
R.A.F. 3B Steel, 78s. to 80s. per cwt., Basis. (Black or Blue Reeled.)	
R.A.F. 9A Sheet Steel, 30s. to 32s. per cwt.	

TIMBER.—The chief point of interest this week is an order issued by the Board of Trade commandeering all stocks of Mahogany and American Walnut.

"In pursuance of the powers conferred upon them by regulations 2B and 2JJ of the Defence of the Realm Regulations, the Board of Trade hereby take possession of all stocks exceeding in the aggregate 5,000 super feet of Mahogany in logs, flitches, planks and boards, and all stocks exceeding in the aggregate 5,000 super feet of American Walnut in logs, planks or boards in the United Kingdom at the date hereof.

"In connection with the foregoing notice of requisition, return forms and instructions as to the filling in of same have been sent to all the firms known to handle Mahogany and/or American Walnut.

"Any firms holding stocks (amounting to more than 5,000 super feet) of either wood, who have not received the necessary return forms, must obtain same by applying to the Controller of Timber Supplies, Room 216, Caxton House, Westminster, London, S.W.1.—Board of Trade, August 24th, 1917."

In view of the shortage of the woods referred to, due to an inefficient control, one would have thought that there would have been no necessity for such an order as the above. One does not wish to be hasty in passing any criticism, in fact, it is extremely difficult to understand what the effect of the order will be until further particulars have been furnished. In other words, the order lacks explicit details. One understands that it has received a very unwelcome reception among the Timber merchants.

It is reported that the Oregon and Washington Spruce producers have agreed on a fixed price to be charged to the Allies for aircraft Spruce. Very large demands are expected from the Allies, and the producers have agreed to supply them at £21 per 1,000 ft. board measure. This equals about £42 per Standard, f.o.b. The price appears to be very reasonable, and, after adding freight and charges, it should still be very much below the abnormal prices now being obtained. One presumes that the Air Board, if it has not yet had an opportunity of accepting the offer, will accept it when the Spruce producers have submitted it to them. Two important questions should be kept in view when reading the above offer. (1) Will the Air Board arrange for an efficient and capable inspection of the wood? (2) Will shipping facilities be afforded for sufficient supplies to be imported here to meet the ever-increasing and colossal demand of aircraft constructors?

As regards the former, recent experience does not give a feeling of confidence. In the meantime the situation continues exceedingly grave. The prices of all aircraft Timbers are soaring upwards, with very little hope of their dropping to a reasonable level, and, in fact, it is more than difficult to obtain supplies of certain woods at any price.

Current Prices.

Silver Spruce, 17s. 6d., c.f.	
English Ash, 13s. 6d. to 15s., c.f.	
Walnut, 2s. 3d. to 2s. 6d., s.f.	
Mahogany, 2s. 2d. to 2s. 4d., s.f.	

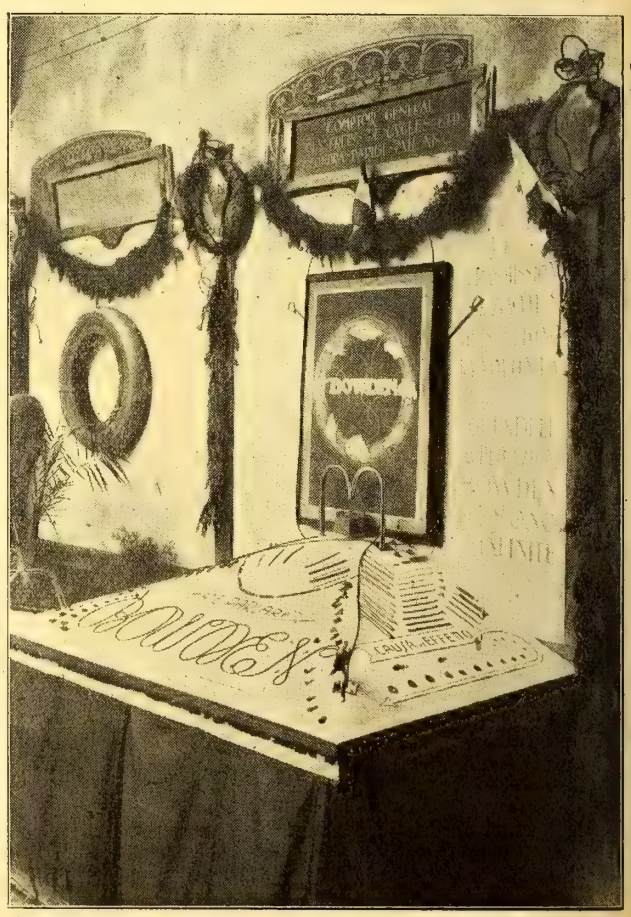
Prices include selection and delivery.

FABRIC.—The feeling of indignation at the absurd prices charged by the Air Board still continues, and one is inclined to think that Lord Rhondda might do worse than give the question a little attention. One understands that the Air Board are charging Russian Flax to the spinners at approximately 600 per cent. more than they were paying when allowed to deal direct. Furthermore, the Irish Flax growers have been notified that the Government intend taking control of all Irish Flax. One is anxious to know at what price this will be charged to the spinners. Someone is apparently out to make a Government Department show a substantial profit, and it would not be surprising if the spinners did not insist upon an increase in price, in view of the atrocious prices they are compelled to pay for Flax.

Supplies are fairly satisfactory.

Official Price.

17C Fabric.....2s. 8d. per yard, 36 in.



The Bowden Wire Company's Stand at the Milan Aero Show.

FLAX AND FLAX YARNS.

Flax grown in the United Kingdom is to be taken possession of by the Minister of Munitions under an Order dated the 25th August. The text of the Order is as follows:

The Minister of Munitions, in exercise of the powers conferred upon him by the Defence of the Realm Regulations and all other powers thereunto enabling him, hereby gives notice and orders as follows:

1. He hereby takes possession as from the date hereof of:

(a) All flax of the 1917 crop grown in the United Kingdom as and when harvested.

(b) All flax grown in the United Kingdom at any time and not at the date hereof in the possession of a flax spinner for the purpose of his business.

(c) All other flax, except Russian flax, now or hereafter situated in the United Kingdom.

2. The flax, of which possession is hereby taken under paragraph 1 (a) and (b), will be divided under the directions of the Controller of Aeronautical Supplies into six grades according to its quality, handling, and cleaning, and the Minister will pay the following prices therefor:

Special grade—35s. per stone delivered at the appointed centre.
1st grade—32s. 6d. per stone delivered at the appointed centre.
2nd grade—30s. per stone delivered at the appointed centre.
3rd grade—27s. 6d. per stone delivered at the appointed centre.
4th grade—26s. 3d. per stone delivered at the appointed centre.
5th grade—25s. per stone delivered at the appointed centre.

Flax which is inferior in quality to that of the fifth grade hereinbefore mentioned will be paid for upon terms which will be subsequently communicated to the various owners.

3. If after this notice and Order any person having control of any flax of which the Minister has taken possession hereunder sells, removes, or secretes such flax without the consent of the Minister, he will be guilty of an offence against the Defence of the Realm Regulations.

4. No person shall as from the date hereof until further notice purchase, sell, offer to purchase or sell, or, except for the purpose of carrying out a contract in writing existing prior to the date hereof for the purchase of such flax, enter into any transaction or negotiation in relation to the sale or purchase of any flax situated outside the United Kingdom.

5. Further directions with regard to the delivery of flax of which possession is taken hereunder will shortly be issued on behalf of the Minister by the Controller of Aeronautical Supplies.

6. All communications upon the subject of this notice and Order should be for the present addressed to the Controller of Aeronautical Supplies and marked Flax Supplies, Dept. S. (m.A.)1, Air Board Office, Strand, London, W.C.2.

A second Order, dated the 25th August, issued by the Minister of Munitions, relates to wet spun yarn made of flax line, and is as follows:

(1) No person shall on or after the first day of September, 1917, until further notice, spin or manufacture any wet spun yarn made of flax line except under and in accordance with the terms of a licence issued under the authority of the Minister of Munitions.

(2) No person shall as from the date hereof until further notice purchase or take delivery of any wet spun yarn made of flax line except under and in accordance with the term of a licence issued under the authority of the Minister of Munitions, or sell, supply, or deliver any such wet spun yarn to any person other than the holder of such a licence as last aforesaid.

(3) All applications for a licence in connection with this Order shall be addressed to the Controller of Aeronautical Supplies, Dept. S. (m.A.)1, Air Board Office, Strand, W.C.2.

AN INCREASE IN WAGES.

Woodworkers engaged on the manufacture of aircraft have been awarded a wages advance of 3s. a week, to date from August 1st.

AIRCRAFT FITTINGS.

The Rotax Motor Accessories Co., Ltd., of Rotax Works, Willesden Junction, N.W.10, have issued an illustrated catalogue which should be of considerable interest to the Aircraft Industry.

In addition to lists of integral parts such as streamline wires, universal fork joints, shackles, shackle pins and so forth, the list includes illustrations, descriptions and prices of such details as tank caps and seatings, combined petrol and oil-fillers, strainer petrol tap and unions, aeroplane hand-pressure pumps and pressure gauges, hinges, door-fasteners and turn-buttons, accumulaters, terminals and switches and small accessory parts, provision for which has, of course, to be made in advance in order that they may conform with the general specification of a machine. Such a catalogue is, therefore, of considerable use in making preliminary selection. All important accessories and integral parts are passed at the Rotax Works by the A.I.D.

ITALIAN COMMERCIAL NOTES.

The "Italian Touring Club Gazette" points out how fitted the country between Rome and the nearest sea coast is for a great international aero terminus. The four main transcontinental lines would cross there, it being obviously essential to avoid any unnnecessary travelling over or organisation in the present enemy countries. I am convinced personally that few tigers ever lose their claws even when they change their spots. So the trans-continental lines must be "super-national." It rather looks as if there is going to be a great slump in frontiers—or rather in the barriers which are set up along them.

From the same source one learns that the U.S. Mission travelled about these skies, eight men in the same 'bus. Rather too like putting all one's eggs, etc., etc.—not that eggs even yet are as valuable as Americans.

An enormous biplane, which escorted the party, beguiled the monotony of the trip by looping and other undignified modes of procedure, suggestive of moths, humming birds, and such small "volatiles."

The Editor of the journal claims for this country the merit of having the biggest existing flying-machine, the one with greatest horse-power, and the one that is fastest.

One has heard many hints as to this last, the latest feather in Italy's *hat*—or should I say *sky* or *wing*?.—T. S. Harvey.

A NEW PROHIBITION.

A Proclamation has been issued prohibiting the importation into the United Kingdom, except under licence from the Board of Trade, of all machinery driven by power and suitable for use in cutting, working, or operating on wood, including sawing machines of all descriptions; general joiners; mortise, tenon and boring machines; lathes and rounding machines; scraping and sandpapering machines; saw-sharpening and setting machines; saw stretchers and brazing apparatus; and electrical motors up to one-half horse-power.

[These particular machines are of the kinds needed in aircraft factories. It is to be hoped that import licences will be granted freely to firms which supply the Aircraft Industry.—Ed.]

AMERICAN AIRCRAFT PRODUCTION.

A message from New York on August 13th states:—The Washington correspondent of the Associated Press states that neutral countries have been pouring in orders for American aeroplanes at such a rate that in order to preserve the supply for itself and the Allies the United States Government has been obliged to prohibit the export of aircraft except by licence.

A report from Washington on August 8th stated that Mr. Daniels, Secretary of the Navy, has arranged for the construction of a new aircraft factory at the Navy yard of Philadelphia at a cost of £200,000. The factory is to be completed in one hundred days, will employ 2,000 workers, and will produce a thousand small aeroplanes annually.

[Evidently a U.S. equivalent for the Royal Aircraft Factory. Let us hope that it will follow the methods of the new R.A.F. and not of the old.—Ed.]

THE SUNBEAM CO.'S CHARITY SPORTS.—An account of this function appeared in the previous issue of "The Aeroplane."

(*Continued from page* 652b.)

MARSHALL.—Sec. Lt. John Arthur Marshall, Cyclist Batt. and R.F.C. (previously reported missing, now officially reported killed in aerial combat on April 6th), was elder son of Capt. James Marshall, King's Royal Rifle Corps, of Hartford Cottage, Huntingdon. He was 19 years of age. He had his commission in the Army in December, 1914, and received his "wings" in November, 1916.

McLAREN.—Sec. Lt. the Hon. Francis W. S. McLaren, R.F.C., M.P. for the Spalding Division, met his death while flying at Montrose on August 30th. He was about a mile out at sea in fine weather at a considerable height when his machine was seen to descend rapidly, almost perpendicularly, and then to right itself again, move along on the level, and circle once or twice. When about 60 ft. from the water it suddenly dived straight down into the sea. Before a rowing boat from the beach reached the spot, two motor fishing boats had arrived, and after some difficulty Mr. McLaren, who was unconscious, was removed from the aeroplane. He had received severe internal injuries, and was badly hurt in the face, and his death took place just before the boats landed at the harbour. Mr. McLaren had been at Montrose since July. A military inquiry into the cause of the accident will be held.

Mr. McLaren was the younger son of Lord Aberconway, and was born in 1886. He was educated at Eton and Balliol, where he took honours in modern history, and afterwards became a member of the Inner Temple. When the war broke out he joined the R.N.V.R., and went with the armoured cars first to Belgium and later to Gallipoli, where his car took part in an advance and his driver was shot by his side. He accompanied the armoured cars when they were sent to Egypt. He spent some months there, but resigned from the R.N.V.R. when there seemed little chance of active service with the armoured cars, and came home and joined the R.F.C. Before his training was completed at Brooklands he became seriously ill, and remained so for several months.

At the very time when he had been pronounced well by his doctor Mr. McLaren learned, to his amazement, from a letter from a constituent, that without his knowledge he had been invalided out of the Army. For several months he besieged the War Office until at last he secured reinstatement, and although he was beyond the age when men are usually admitted into the R.F.C., he was after some delay readmitted and was posted to a flying squadron for training at Montrose. He was nearing the end of the advanced course when his death occurred.

He had represented Spalding in the Liberal interest since January, 1910, and while in the House was Parliamentary Secretary to Mr. (now Lord) Harcourt, when Commissioner of Works and Colonial Secretary. He was a J.P. for Denbighshire. Mr. McLaren married in 1911 Barbara, daughter of Sir Hubert Jekyll, K.C.M.G., and leaves two sons, aged three and two.

MORGAN.—Sec. Lt. Albert S. Morgan, R.F.C., previously reported missing, now reported killed in action on April 22nd, was the elder son of Mr. and Mrs. A. M. Morgan, "Deepdene," Manor Mount, Forest Hill, and formerly of Loughton, Essex.

NICHOLSON.—Sec. Lt. Geoffrey Shield Nicholson, R.F.C., who was wounded on August 21st and died in a clearing station on the following day, was the only son of Professor and Mrs. Shield Nicholson, 3, Belford Park, Edinburgh, and grandson of the late Professor W. B. Hodgson. He was born on August 6th, 1894. As a boy he was rather delicate, and after being at Merchiston he was educated privately for Edinburgh University. When war broke out he was in his second year reading for History Honours and the Law degree. He joined the O.T.C., and being much interested in flying went to the Beatty School at Hendon, and obtained his pilot's certificate in November, 1915. In the February following he obtained a commission in the Black Watch, was transferred in February, 1917, to the Royal Flying Corps, and got his wings in June. He had been flying at the front about six weeks. He was a well-trained musician and showed fine literary tastes.

PRITCHARD.—Sec. Lt. Thompson Thomas Pritchard, R.F.C., was killed whilst flying in North Wiltshire on August 29th.

ROBERTS.—Lt. C. Roberts, R.F.C., was flying at a great height near Hounslow Heath on August 31st when the machine nose-dived to the earth, the pilot being dead when picked up.

The mystery of the death of Mr. Roberts was not cleared up at the inquest at Hounslow on Sept. 3rd. The evidence showed that, when flying, the machine burst into flames, the wings fell apart, and that then there was an explosion, followed by a quick nose-dive to earth. Experts stated that the machine was in order before going up, and that the petrol tank was discovered after the accident sound and intact. No leakage, therefore, could have taken place, and the cause of the flames was unexplainable. A verdict of accidental death was returned.

SPEAR.—Sec. Lt. Norman Victor Spear, R.F.C., who was killed in a flying accident at Pulham St. Mary's Norfolk, on August 29th, was the youngest son of William Spear, F.R.G.S., of "Nordland," Woodstock Road, Golders Green, N.W. He was 29 years of age.

SILLEM.—Sec. Lt. Stuart Charles Sillem, R.F.C. (killed in action on August 12th), was only son of Mr. and Mrs. Charles Sillem, The Chestnuts, Minchinhampton, Gloucestershire. He was 19 years of age, and had his wings in June this year.

STUART.—Capt. James Stuart, R.F.C., Royal Inniskilling Fus., who was reported missing on April 13th, now officially reported killed on that date, was the eldest son of Mr. and Mrs. Stuart, Somerset, Coleraine, Co. Londonderry.

VAILE.—Lt. Laurence E. Stuart Vaile, R.F.C., who was killed in a flying accident in Norfolk on August 29th, was the elder son of the Rev. A. and Mrs. Vaile, of West House, Seaford, Sussex. He went out with the B.E.F. in August, 1914, as a dispatch rider, in which capacity he saw 2½ years' service. Last January he was gazetted to the R.F.C., where he graduated, eventually becoming an instructor.

ENGAGEMENTS.

LYSTER-SMYTHE—LEAROYD.—The engagement is announced of Lt. Cecil St. George Lyster-Smythe, East Surrey Regt. and R.F.C., second son of Col Lyster-Smythe, D.L., R.F.A., and Mrs. Lyster-Smythe, and Eileen, daughter of Mr. and Mrs. Learoyd, Launde Abbey, Leicester, and Williamstown Lodge, Co. Clare.

SHAW—LAWSON.—An engagement is announced between Capt. John S. Shaw, R.F.C., eldest surviving son of Mr. and Mrs. J. G. Shaw, Royal Cross School, Preston, Lancashire, and Gladys K., second daughter of Mr. and Mrs. James Lawson, Latham House, Preston.

MARRIAGES.

BIRD—PEMBERTON.—On Aug. 25th, at the Parish Church of Chingford, Essex, Lt. Alfred Harry Bird, R.F.C., elder son of Mr. Harry Bird, C.C., F.S.S., and Mrs. Bird, of Chingford, was married to May Eveline, second daughter of Mr. and Mrs. A. S. Pemberton, of Chingford, by Canon A. F. Russell.

DICKINSON—WAUCHOPE.—On August 23rd, at the Parish Church, West Hampstead, Capt. C. J. Dickinson, R.F.C., elder son of Mr. and Mrs. W. R. Dickinson, was married to Janet Caroline Sutherland, daughter of Major and Mrs. C. J. Wauchope.

MURRAY—WOODRUFF.—On August 29th, at St. Michael's le Belfry, York, Major E. M. Murray, M.C., Q.V.O. Corps of Guides, attd. R.F.C., eldest son of Col. R. D. Murray, I.M.C. (retired), and Mrs. Murray, Nevern Square, S.W., was married to Gwladys Vivienne, only daughter of Mr. and Mrs. Henry H. Woodruff, of Barnsley and Harrogate.

ROBERTS—FEW.—On August 31st, at Folkestone, Patrick Roberts, R.F.C., son of the late Mr. and Mrs. Patrick Roberts, of Vancouver, B.C., was married to Vera Marguerite Fetherstonhaugh Few, younger daughter of the late Mr. and Mrs. A. B. Few, of Calgary, Alberta, Canada.

STEEL—BRADLEY.—On August 23rd, at S. Margaret's, Bentham, Frank Steel, Captain, Essex Regt. and R.F.C., youngest son of Charles Denton Steel, I.C.S. (retired), and Mrs. Steel, of Westcliffe-on-Sea, was married to Isobel May, eldest daughter of Robert Bradley, M.R.C.S., and Mrs. Bradley, of Bentham.

TOD—BATES.—The marriage between Sec. Lt. Malcolm Tod, Black Watch and R.F.C., youngest son of the late A. Maxwell Tod and Mrs. A. Maxwell Tod, of Heath Cottage, West Byfleet, Surrey, and Margaret Evelyn May, only daughter of the late J. Curling Bates, M.R.C.S., L.R.C.P., and Mrs. F. Curling Bates, of 62a, Central Hill, Upper Norwood, took place at Christ Church, Gipsy Hill, Norwood, on Wednesday, Sept. 5th (to-day).

BIRTHS.

JOHNSEN.—On Sept. 1st, at 72, Plaistow Lane, Sundridge Park, Kent, to May (née Bowater), the wife of Capt. W. O. C. Johnsen, R.F.A. and R.F.C.—a son.

TOWNSEND.—On August 27th, at Orchardleigh, Pinner, the wife of Capt. R. T. Townsend, Canadians and R.F.C., of a daughter.

The parents of Lt. Bernard Coombes, R.F.C., who has been officially reported missing, have been informed that, according to messages dropped by an enemy aviator in France, he and his observer landed in the German lines, and were made prisoners.

* * *

Sec. Lt. R. J. Grandin, A.S.C., attd. R.F.C. (sometime temp. Capt., A.S.C.), was reported missing on Western Front on May 18th. Mrs. R. J. Grandin, of 58, Anson Road, N., will be glad if those communicating with R.F.C. officers now prisoners in Germany, either in hospital or camp, will inquire as to the fate of the above.

Lt. Maurice Moore, York and Lancs Regt. and R.F.C., who was reported missing on July 22nd and believed killed, is now a prisoner of war at Karlsruhe. He is the youngest son of the Rev. J. Wright Moore, rector of Kirkheaton.

* * *

The "Times" correspondent, writing from British Headquarters on August 28th, says:—

The work of the Royal Flying Corps for the last complete week during which it is possible to tabulate the whole of the aerial achievements constitutes a record for any corresponding period during the war.

The number of hostile batteries successfully engaged with the help of aeroplane observation is well over 700, and the number of gunpits destroyed during this time is 128. More than 300 explosions were caused among ammunition dumps and other combustible material. This is counter-battery work with a vengeance. Bombs were dropped all over distinct military objectives.

The enemy aircraft brought down was 68, whilst another 90 were driven down out of control.

* * *

RE SEC. LT. MARK DENHAM DRAPER, deceased. Pursuant to the Law of Property Amendment Act, 1859, Notice is hereby given that all Creditors and other persons having any claims or demands against the Estate of Mark Denham Draper (sometimes called Marcus Draper) late of The Rectory, Adel, near Leeds, in the County of York, a Second Lieutenant in the Royal Flying Corps and previously a Theatrical Manager deceased (who died on the 7th day of February, 1917, Intestate and to whose Estate Letters of Administration were granted out of the Wakefield District Registry of the Probate Division of His Majesty's High Court of Justice to The Revd. William Henry Draper, the Father of the deceased, of The Rectory, Adel aforesaid, on the 27th day of August, 1917) are hereby required to send the particulars in writing, of their claims or demands to us, the undersigned Solicitors for the said Intestate on or before the 13th day of October, 1917, after which date the said Administrator will proceed to distribute the assets of the said deceased amongst the persons entitled thereto, having regard only to the claims and demands of which he shall then have had notice, and he will not be liable for the assets of the said deceased or any part thereof so distributed to any person or persons of whose claims or demands he shall not then have had notice.

Dated this 28th day of August, 1917.

NELSON EDDISONS & LUPTON, 34, Albion Street, Leeds, Solicitors for the said Administrator.

FRANCE.

OFFICIAL COMMUNIQUÉS.

SEPT. 1st.—On the Aisne front we attacked at 7 p.m. yesterday the enemy position north-west of Hurtebise.

Our aircraft took part in the attack, keeping at a height varying from 100 to 600 metres (330 to 1,980 ft.), and bombarding the enemy with machine-guns in his trenches and at his batteries. All our machines returned.

ARMY OF THE ORIENT.—An enemy aeroplane was obliged to descend near Lake Doiran.

SEPT. 2nd.—Two German aeroplanes were brought down by the fire of our anti-aircraft guns on August 21st and 22nd respectively in circumstances of particular difficulty. The first machine was struck at a height of 2,000 metres (6,600 ft.) by a shell from a motor-gun belonging to the 42nd Section, and came down between Bouçonville and the front lines. The second which was flying over our lines at a height of more than 5,000 metres (16,500 ft.), was struck by a bursting shell fired by Post No. 48 and came crashing to the ground some kilometres from Souilly.

SEPT. 3rd.—German aeroplanes dropped bombs on Dunkirk and Belfort. At Dunkirk several civilians were killed or wounded.

* * *

Julian Cornell Biddle, pilot, Escadrille Lafayette, French Flying Corps, who was killed in a flying accident in France on August 18th, was 27 years of age. He was the younger son of Mrs. Arthur Biddle, of Philadelphia, U.S.A., and a graduate of Yale University, Class of 1912.

GERMANY.

OFFICIAL COMMUNIQUÉS.

AUGUST 28th.—In the afternoon the most intense drumfire began in the battle zone between Langemarck and the Roulers-Ypres railway. With the use of numerous Tanks and aeroplanes flying at a low altitude, the English infantry soon after advanced to the attack on this front.

During the last few days Lt. Voss has gained his 38th aerial victory.

SEPT. 2nd.—Baron von Richthofen yesterday achieved his 60th aerial victory.

* * *

The Exchange Telegraph Company's special correspondent at Lausanne says: The "Basler Nachrichten" of August 28th states that French aviators are making persistent raids upon Rhine military bases and bridges. Each night flying men drop a large quantity of bombs, and in some cases the damage done has been very extensive. One of the Rhine bridges at Mannheim was blown up recently.

RUSSIA.

OFFICIAL COMMUNIQUÉS.

AUGUST 31st.—BALTIC SEA.—During the past week the enemy has shown an increased activity in the Baltic Sea. About 40 enemy bomb-carriers and battleplanes carried out a series of raids on various islands in the Gulf of Riga and in the entrance to the Gulf of Finland, dropping about 90 bombs on the ships of the Fleet and on harbour works.

Our naval aviators had a series of aerial engagements with the enemy, in the course of which we suffered no loss or damage.

SEPT. 1st.—On August 29th Captain Kozakoff brought down his 16th enemy aeroplane, which fell in the region of Pruskurov. The German aviators were killed.

SEPT. 2nd.—In the region of Dvinsk Ensign Efimoff brought down a German aeroplane, which fell into our lines. The German aviators were taken prisoners.

In the region of Brody one of our machines, with the aviator Lieut. Ludnovski, was engaged in an aerial battle with an enemy battleplane. Both machines fell in the enemy lines.

* * *

A Petrograd dispatch by "Agence Radio" to the "New York American," dated August 14th, says: "High up in the air in an observation balloon Kaiser Wilhelm witnessed the victorious advance of the Austro-German forces on the occasion of his recent visit to the Galician front, and saw the Teutonic forces successfully effect a crossing of the Sereth

AUSTRIA.

OFFICIAL COMMUNIQUÉS.

AUGUST 29th.—Trieste has again been bombed by enemy aviators, but no damage worth mentioning was done.

AUGUST 30th.—For the third time during the past 48 hours Trieste has been bombed by enemy aviators Several civilians fell victims to their bombs, and several private buildings have been damaged.

SEPT. 1st.—Trieste has again been the objective of Italian aviators, and the episcopal palace has been damaged.

SEPT. 2nd.—The open town of Trieste was again visited yesterday by Italian aviators, who dropped 70 bombs altogether.

SEPT. 3rd.—Italian aviators dropped bombs on several towns on the west coast of Istria. An enemy air squadron making for Trieste was driven back by our naval planes before it reached its objective.

ITALY.

OFFICIAL COMMUNIQUÉS.

AUGUST 28th.—Unfavourable atmospheric conditions have greatly impeded the activity of our aeroplanes.

AUGUST 30th.—Our aircraft successfully renewed the bombardment of the enemy batteries in the Panovizza wood (east of Gorizia).

AUGUST 30th.—Altogether 246 aeroplanes participated in the battle (on the heights East of Gorizia). A squadron of 40 Caproni machines, which took part in the action to the east of Gorizia, dropped over 7,000 kilogrammes (about seven tons) of projectiles on enemy batteries in the Panovizza Wood (about one mile from Gorizia and extending eastwards about 1½ miles).

AUGUST 31st.—Regardless of the violent anti-aircraft fire, our aeroplanes successfully bombarded the railway establishments of the Tolmino (Upper Isonzo) area and the communication lines on the Carso.

SEPT. 1st.—One of our flights bombarded the railway establishments at Grahovo (Tolmino) with three and a half tons of bombs.

SEPT. 2nd.—Our aeroplanes effectively bombarded the reverse of the enemy positions on Mt. San Gabriele.

Above Belluno an enemy machine was brought down in an air fight.

* * *

A "Morning Post" correspondent's dispatch, published on Sept. 1st, says:

One of the surprises of the Italian offensive has been the conspicuous success of the Air Service. The mastery of the air seems to have passed on that front into the undisputed possession of the Italians. Alike on the Bainsizza Plateau and on the Carso they have become in a novel and extraordinary way the cavalry of the air, and I am told by an authority on the Italian Air Service that a very considerable proportion of the Austrian casualties in both sectors have been the result of the admirable and daring work of the Italian aviators, who have swooped down incredibly low over the retreating Austrians and raked them with machine-gun fire. The same authority tells me that there have been times when as many as 281 Italian aeroplanes have been operating in one engagement, and that, notwithstanding enemy statements to the contrary, only two Italian aeroplanes have been driven down in this offensive, one within their own lines.

TURKEY.

Official Communiqués.

August 26th.—In the course of the operations our aircraft carried out successful attacks, dropping 450 kilos (9 cwt.) of bombs on the enemy.

August 31st.—Our aircraft dropped bombs on the enemy cavalry. There was no event of importance on the other fronts.

Sept. 1st.—On the Caucasus front there was enemy aerial activity.

During the day of August 31st enemy aerial activity increased.

On the night of Aug. 29th enemy aircraft again attacked Smyrna, with the result that four persons were killed, two wounded, and several houses destroyed.

BULGARIA.

Official Communiqué.

Sept. 2nd.—An enemy aeroplane was brought down by our anti-aircraft fire near Demir-Hissar, and fell behind the British lines.

RUMANIA.

Official Communiqués.

August 28th.—In the neighbourhood of the villages of Ivancea, Bratu, and St. George Russian machine-guns brought down a seaplane, which fell in flames in the enemy lines.

August 29th.—On August 13th one of our aeroplanes attacked three enemy aeroplanes, one of which was brought down, and fell behind the enemy lines in the Putna Valley.

DENMARK.

A report from Copenhagen states that a wrecked airship, the nationality of which is not known, passed across the southern part of Jutland on August 30th, coming from the North Sea, and disappeared over the Cattegat. Several steel ropes, to which were attached iron hooks, were dragging behind the airship, which was so low that they tore down telegraph wires, trees, and the roofs of houses, and killed and injured many domestic animals. Great damage was done at several places A man was observed to be in the car.

Another account states that the derelict was a kite-balloon.

HOLLAND.

A message from The Hague, dated August 28th, states that the German Government and the Commander-in-Chief have expressed regret for the "deplorable incident" of August 18th "which fortunately was not accompanied by any victims," when two German aeroplanes dropped nine bombs on Goeree, Renesse, and Zerikzee (south-west Holland).

They point out that the aviators, who were above the clouds, believed themselves to be still over the sea. The German Government has agreed to pay compensation for the material damage caused by the bombs dropped.

* * *

The Amsterdam "Telegraaf" learns from Emmen that a German biplane while making a trial flight landed on August 28th at Valthermonde. The two occupants will probably be interned.

SWEDEN.

Lieut. Sandström, a well-known Swedish aviator, was killed near Malmö on Sept. 1st.

AUSTRALIA.

A dispatch received by the High Commissioner for Australia on August 29th from Mr. C. E. W. Bean, official Press Correspondent with the Australian Imperial Force in France, says:—

When Australia had on the Western Front no Flying Corps of her own, a large contingent from the Australian Imperial Force was permitted to enter the Royal Flying Corps. A number of Australians had also joined the Royal Flying Corps direct. The result is that there are two bodies of Australian fliers now in France—a large number scattered through the squadrons of the Royal Flying Corps, many of whom have been flying for some time, and those squadrons of the Australian Flying Corps which are now on the Western Front. The work of the Australian Flying Corps will always be easy to identify for their country's history; but the deeds of Australians in the Royal Flying Corps will be most difficult to collect and record.

One of the first Australian aviators whose work came to the ears of the Australian Forces when they arrived in France was a young officer of the Royal Flying Corps in the Ypres salient. It was in the early days of the Somme offensive, shortly after the British had made their first successful raid on the German sausage balloons. In one of these raids opposite Ypres the aviator approached a German balloon which was being drawn down under such a barrage of shrapnel that it seemed impossible to get near it. By the time he was over it it was within three hundred feet of the ground. In the midst of the barrage he pretended that one of the shells had hit him, and came side-slipping down towards the earth. The anti-aircraft gunners stopped at once, as did everyone else, to see him fall. As he came down close to the balloon he righted his machine, fired into the balloon, and brought it down burning, and got clear away before the Germans had time to realise what he had done. The same trick has been played often enough since—he watched a German do it near Bapaume. But that was the first time we heard of it. The man who did it, and who was decorated for it, was a Victorian.

There was one of whom Australians perhaps have never heard, who came out of the Australian Force into the Royal Flying Corps, and left a grand name amongst those who knew him—Capt. Shepherd, D.S.O., M.C. No story of him was finer than that of his last fight. On returning from leave he heard that his best friend had "gone West," as they say, three days before. His friends tried to dissuade him from doing anything rash, but the next day, when he was out leading three other planes, twelve Germans appeared, and he drove straight into the thick of them. It was a wild fight, but they got him, and the Army lost a magnificent aviator. Another Australian soldier whose name ought to live in the annals of flying was Sec. Lt. Wilfred Graham Salmon, who, as the merest novice, went by himself straight into the heart of the twenty odd huge German planes which raided London last June, and who, when hit, managed to guide his machine to within a few hundred yards of his aerodrome before the brave effort ended and he crashed.

U.S.A.

A message from New York, dated Sept. 1st, states that the special correspondent of the Associated Press at the American Field Headquarters in France has telegraphed that one of the most valuable aids the French are giving just now is in lending to the Americans scores of hundreds of their German prisoners, the largest number of whom are rather strenuously engaged in preparing a remarkable American aviation camp, where cantonments will be erected to accommodate 15,000 student fliers, the aviation field itself being several miles square, probably the largest in the entire European war zone.

Scores of American aviators now studying with the French wear French uniforms, and will join the French Flying Service, from which they may later be remobilised into the American Army as may be needed when the Americans take their place in the line. The French are delighted with the aptness of their American pupils, who seem to have a natural taste for flying.

AIR CURRENTS.

The following yarn of a local branch-line seems to illustrate the peculiar ideas held by some people regarding hostile aircraft.

A passenger on a local train was much disturbed by an aeroplane which followed the train and circled above it at each halt. Presently the whole train was agog with excitement, including guard and driver. At a certain station the station-master was summoned, and a pow-wow took place, which resulted in the train being side-tracked for an hour. And the joy of the whole case is that this was done because the finding of the pow-wow was that it was a hostile aircraft which was using the train as a guide to London.

* * * *

One hears of joy-riding amongst pilots in training. Here are two choice examples. At a Midland resort, those enjoying a hot day on the river were surprised by the descent of a biplane in a field of no great size bordering the water. There alighted pilot and passenger, who disported themselves in a boat until satisfied, and then started up, got out of the field somehow without hitting anything and disappeared towards their aerodrome.

In another case a pilot coolly brought his machine down in a very lumpy field near a station, took on board a passenger, restarted with the help of local porters, and went off for a joy-ride quite unconcerned.

* * * *

It is said that when the Boche raided a certain aerodrome, a pilot on a fast, new machine drove them off by performing the most alarming stunts all round them, quite regardless of the fact that that pilot's sole offensive implement was an automatic pistol warranted to jam in five rounds.

* * * *

Great are the stories told of one inspection department by another, but surely that related of an A.I.D. man who was found measuring rubber pipe with a micrometer is the best.

* * * *

Near a certain French aerodrome there used to be a very pleasant chateau where a hospitable family received a pilot, be he half-fledged or an "ace," with truly Gallic warmth. Presently the powers-that-be began to notice that the air round this chateau had a most peculiar effect on engines, as machine after machine had to land thereabouts until mechanics summoned from the sheds could effect repairs. Not believing that the air was as deadly as stated, the French equivalent of our A.P.M. took the matter in hand, with the result that a number of sportsmen found themselves under "detention."

At a certain station of peaceable disposition, there arrived one day a fighting machine, sent there that one of its numerous gadgets might be tested.

Naturally, the said machine was equipped with its full lethal weapons, which, equally naturally, the men of the said station knew nothing about. Having, however, a wholesome idea that machine-guns should be reverenced, and not knowing how to unload, the gun was rendered "harmless" by building a neat wooden fence all round those parts of it that seemed capable of mischief.

* * * *

Which is not unlike the policeman of early motoring days who found an abandoned car and tethered it with a rope.

* * * *

It is wonderful that, after many years, the British public will insist on calling all Boche machines Taubes, or rather "Torbers" and "Tawbs," to take their pronunciation, and after all our stately weeklies have explained aeroplanes to all concerned with great care and repeated vim.

* * * *

Funnily enough, not only the B.P. but also a large majority of soldiermen "over there" use the obsolete description.

* * * *

One French school-plane is embellished with the old familiar railway notice, "Defense de se pencher au dehors." Advice very readily taken by the aspirant to aerial honours.

* * * *

A friend writes:—"I was going into a shop with another fellow, who was wearing the observer's badge, and two little urchins looked hard at us. The first remarked: 'Say, Bert, what's one of them blokes got one wing for and the other two?' 'Don't know,' says the other urchin. 'S'pose it's 'cos one flies on a monoplane and the other 'as a biplane.'"

* * * *

Some people look at things quaintly. One of the R.N.A.S. pilots out in the East wrote home and told his mater he hoped to be coming home shortly. She promptly replied as follows: "I do not think you would do any better by coming home, as you would only have to fight. There are such a lot of accidents in the Flying Corps in France." And this to a chap who has been chasing Huns over snow-covered mountains and thousand-foot precipices for a year or so.

* * * *

A petition to the Government is being signed asking that coloured captive balloons should be flown over London when there is little likelihood of an air raid. It is suggested that when a raid is expected the balloons should be hauled down a few minutes before the bomb signals, as an additional warning. The balloons would carry a coloured light at night, and special constables would have small button-hole electric lamps, showing red for danger and green for "all clear."

Copies of the petition can be had from the Organiser of A.S. Captive Balloons, 9, Stone Buildings, Lincoln's Inn, W.C.2.

Surely "ASS. Captive Balloons" would be a better address.

AN INTERESTING SOUVENIR.

People who are interested in Zeppelin souvenirs will like the picture book concerning Zeppelin L.48, brought down in East Anglia on June 17th. Mr. J. S. Waddell, of the Hayling Studio, Leiston, Suffolk, is responsible for its production, and very well he has done it. It contains 24 very well-produced photographs of the Zeppelin, and of various incidents in connection with it, including a photograph of the funeral of the crew, in which the Commanding Officer's coffin is shown, bearing a wreath sent by the R.F.C.—an act of courtesy which will be appreciated by soldiers of all nations, though it may perhaps meet with the disapprobation of ultra-patriotic civilians.

The photographs of the wreckage and its surroundings are of much interest, and show the machine to have been of the standard type, which is practically a cross between a Zeppelin and the Schutte-Lanz. The pictorial souvenir can be obtained post free from Mr. Waddell for 1s. 3d., and Mr. Waddell also publishes an excellent series of picture postcards in connection with the same air fight.

UNNECESSARY ALARM.

At Bow Street Police Court on August 31st, Walter Edward Griffin, of Old North Street, Theobald's Road, was charged before Mr. Garrett with contravening the Defence of the Realm Regulations by spreading by word of mouth a false report to the effect that an air raid was taking place.

Police-sergeant Goldie said that on the night of August 16th he was on duty at 10.30, when the searchlights and anti-aircraft guns began exercising. He saw the defendant leave his own house, Old North Street, and run to and knock at the doors of several other houses, at the same time shouting at the top of his voice: "Come on! The Germans are here! That noise is not guns—it's bombs. Come on down to the Tube." As a result of the defendant's action a number of women ran from their houses half-dressed and children were dragged from their beds. Witness went up to the defendant and told him there was no raid in progress—that it was only practice—but defendant continued to shout "There's a raid!" and went away in the direction of the Underground railway station, followed by a crowd of frightened women and children. Another police officer gave corroborative evidence.

The defendant denied knocking at any doors or creating any disturbance. Mr. Garrett said he was satisfied the defendant had behaved in a manner to cause unnecessary alarm, and ordered him to pay a fine of 40s.

THE HANDLEY PAGE ATHLETIC CLUB.

A very large gathering was present at the Avenue Grounds, Cricklewood Lane, on Saturday (August 25th) to witness the first annual sports' meeting held in connection with the Handley Page Athletic and Social Club, and favoured with ideal weather.

The arrangements were successfully carried out by Mr. W. H. Jones (the chief inspector at Handley Page's, Cricklewood), and the stewards. Amongst the spectators were a number of convalescent wounded soldiers, who had been invited to honour the occasion.

During the afternoon a capital selection of music was given by the Child's Hill Excelsior Silver Prize Band.

A long programme had been arranged, and there were approximately 200 entries for the various events. The races included a generous number of open events, which were confined to aircraft workers in the Hendon and Cricklewood districts, and in these, as also in the club events, there was some keen running. The final results were as appended:—

Boys' 100 Yards' Race.—1st, I. Derry (1½ yds.); 2nd, R. Weston (2 yds.); 3rd, E. Philpot (scratch). Time, 13 4/5th secs.

Men's 100 Yards' Handicap.—1st, J. Hicks (scratch); 2nd, A. Nicholls (4½ yds.); 3rd, H. Bond (3 yds.). Time, 10 3/5th secs.

Ladies' 60 Yards' Flat Race (open).—1st, Miss Cheese; 2nd, Miss Slade; 3rd, Miss Wallis.

Men's 220 Yards' Handicap.—1st, J. Hicks (scratch); 2nd, W. Coldred (8 yds.); 3rd, H. Bond (5 yds.).

Ladies' 60 Yards' Slow Cycle Race (open).—1st, Miss English (Handley Page); 2nd, Miss Heading (Integral Propeller Co.); 3rd, Miss Didman (Handley Page).

Men's 440 Yards' Handicap.—1st, J. Hook (10 yds.); 2nd, G. Mackerell (15 yds.); 3rd, G. Brautigan (15 yds.)—a very close finish between 1st and 2nd. Time, 59 secs.

Ladies' Thread-Needle Race.—1st, Miss Banks and Mr. Martin; 2nd, Miss English and Mr. G. Ensor; 3rd, Miss Cooper and Mr. Weston.

One Mile Scratch Race.—1st, J. Hook; 2nd, W. H. Green; 3rd, A. Phillips.

Tug-of-War.—1st, Dept. 20 (Messrs. G. Ensor, F. Warren, B. England, W. Briars, F. Hill, S. Brazier, G. Sharp and E. Troll—coach, H. A. Warwick); 2nd, Dept. 3.

Gent's Slow Cycle Race.—1st, S. Mayo; 2nd, Frost; 3rd, H. Smith.

100 Yards' Open Handicap.—1st, G. Chater (Smith and Son), 5 yds.; 2nd, J. Hicks (Handley Page), scratch; 3rd, H. Edwards (Grahame-White), 4 yds.

100 Yards' Veterans' Race.—1st, J. Phillips (42 years); 2nd, C. Bleamey (49); 3rd, A. Hardiman (42).

Men's Sack Race.—1st, A. Nicholls; 2nd, A. Crittenden; 3rd, C. Balfour.

440 Yards' Open Handicap.—1st, H. Edwards (Grahame-White), 10 yds.; 2nd, E. S. Deadman (Aircraft Manufacturing Co.), 15 yds.; 3rd, E. J. Powell (Integral Propeller Co.), 10 yds. Winner's time, 57 2/5th secs.

Men's Costume Race.—1st, L. Hogan; 2nd, W. Vono; 3rd, C. Balfour.

Ladies' 60 Yards' Flat Race (confined to works).—1st, Miss Cheese; 2nd, Miss Slade; 3rd, Miss Smith and Miss Calcott (dead heat).

Ladies' Slow Cycle Race (confined to works).—1st, Miss English—the only competitor to reach the tape.

Ladies' Sack Race.—1st, Miss Thomas; 2nd, Miss Robinson; 3rd, Miss Cheese. Miss Cheese, who was first in her heat, unfortunately fell when leading at about three yards from the tape.

One Mile Relay Race.—The Grahame-White Athletic Club entered two teams, as did also the Smith and Sons' A.C.; whilst the Handley Page and Aircraft Manufacturing Co. A.C.'s entered one each. The Grahame-White teams, consisting of Messrs. Edwards, Crabtree, Cohen and Johnson, won in the remarkably good time of 3 minutes 55 seconds. Handley Page came in a good second with Messrs. Bond, Hicks, Hook and Chopping. Aircraft Manufacturing came in third.

The Prizes.

The prizes were presented by Handley Page, Ltd. They were distributed by Mr. F. Handley Page, who was formally introduced by Mr. W. H. Jones. At the conclusion, Mr. Handley Page expressed his pleasure at performing the task, and remarked that he was glad to see so many present. They were also pleased to see the soldiers who had been trying to win, and eventually would win, that other great race.

WHAT WAS THE CENSOR DOING?

The "Times" of August 22nd says;—

Although no official warning was given by means of sound signals in London yesterday, a few minutes after the preliminary notice had been given to police-stations and ambulance corps the news of the raid on the coast spread through the East End and so to the West.

At Hampstead many householders, especially those with children, made for the safety of the Underground Railways. They descended by the lifts, having bought 1d. tickets for the privilege, and stayed in disconsolate groups on the platforms for upwards of an hour.

At all the stations there were similar groups of refugees, and at Camden Town and Warren Street they were particularly large. There was a run on the Metropolitan trains from the East End and an exodus began towards Charing Cross, lasting until long after the all-clear signal had been given.

It would assist the authorities very much if people would refrain from crowding such places before any warning has been issued. There were instances where it was difficult for passengers to get to the trains and the trains themselves were very crowded. The crypt at St. Paul's Cathedral was packed with people.

[This is certainly a nice picture for circulation abroad. If Londoners under prospect of enemy fire behave like that, we must seem a pretty poor sort of Ally. One is surprised that any censor should have passed the paragraph, as it will certainly afford joy to all good Germans, and prove mightily encouraging to those who organise and carry out the raids. The "Times" might at least have told the rest of the truth, which is that for one "refugee" running vainly for cover, there were a hundred gazing casually at the sky to see if there was any sign of a raid, and a thousand going on with their work unconcernedly, merely ready to take cover if a proper alarm was given.—Ed.]

THE BIRD.

(With Apologies to Mr. Kipling.)

If you maintained your faith when all around you
  Condemned the Air and labelled you a Fool;
And persevered until the application
  Of hard, cold facts bore fruit with those who rule.
If you have learned to hear the Truth you've spoken,
  "Noted," "Referred," and passed on to the files,
And known sound words of those who saw the future
  Derided with polite official smiles.
If you have learned the strawless brick to fashion,
  In spite of those who did withhold the straw,
And waited till the blast of silent envy
  Did fan the flame of ridicule the more.
If you have seen the thing that you've created
  (Your recompense of weary months of toil),
Given to those who wait till odds are even,
  Then cluster round to gather up the spoil.
If you have watched from at the central zero
  The mounting list of those who now believe,
I'll bet the world, and all that there is in it,
  You wear a golden bird upon your sleeve!

A SERVICE MACHINE IN THE BREAKING.

By P. B. O.

(Reproduced from "The Wing Tip," the unofficial organ of the R.N.A.S. in Flanders.)

As in other professions and callings, writes "Air Pilot" in the "Daily Wail," there is a certain type of youth who invariably makes a good crasher; this is the supersaturated boy.

The crasher has, in the usual way, been closely associated with sports and manly games in Timbuctoo and the surrounding provinces—this gives him initiative and resource and teaches him to remain calm and cool-headed in all situations, however strange and unpleasant they may be. All these qualifications are necessary to make a man a successful "grass-punisher."

He must have good eyesight, or else he might mistake a roof-top for a haystack or a croquet lawn for a cornfield, and entail heavy damages to a long-suffering Government. For preference he should be between the ages of 16 and 74.

The life of a "wrecker"—that is to say his flying life—varies from five minutes to five months—never more! The great strain on the nerves, although not always at the first effort, begins to make itself felt after he has done three or four really good somersaults on, say, a Nieuport; he then finds that he is no longer so keen on going up as he was, that it takes a glass or so of Horlick's Malted Milk, without soda, to warm his feet and enable him to face the music and again to perform that combined vol-plane and nose-dive so much appreciated by the majority of C.O.'s.

The aspirant to flying honours must be neither too tall nor too short; if the former, he will probably find himself with his feet through the petrol tank and his head through the top plane; while if the latter, he may spoil his personal beauty (peut-être) by violent contact with the instruments or mirror, entailing much scraping and stitching by our friend the Doc.

His weight, for preference, should be on the lighter side, as the machine already possesses sufficient weight to make a really respectable mess of itself, so that an additional 14 or 20 stone will only cause it to spoil the ground for any future operations.

His stomach should be strong: a good sailor has usually about nine lives, and crawls out of the wreckage with a smile of hope—sailors don't care!

Before taking up a machine attention should be paid to the surrounding country: if it is quiet farming land with plenty of trees, barns, and haystacks, it is to be recommended that he tries skimming a haystack or banking round a good solid oak—his machine will then be beyond repair; while if on the sea coast he might try tail-sliding from 5,000 feet into a choppy sea or pancaking on wet sand—both give excellent results.

Finally, he must be hardened to rough words and glances of hate.

AN AERIAL ALPHABET.

A is the airman who looped the Hunguffin*
  For is please read was, he is now in his cuffin.

B is the batman who dirties our quarter,
  Ruins our boots and forgets our hot water.

C is the castor the rotaries use.
  It bucks up both engines and humans,—excuse.

D is for drift, if you land with it on,
  You will, almost at once, realise you were wrong.

E is the engine which causes the motion,
  Which gives you the lift (not caused by promotion).

F is the fairy you love with a pash,
  She is sure to be there on the day that you crash.

G is the gas which makes things go roun',
  And sometimes does not, in which case you come down.

H is the hangar one greets with such smiles,
  On return from a recco of ninety odd miles.

I is the incidence put on each plane,
  From which you get lift I need hardly explain.

J is the joy-stick—I mean control lever,
  Which the Hun† always clings to, as if in a fever.

K is keel surface, it stops you from spinning,
  Perhaps, if you know when the spin is beginning.

L is the loop you're intending to do,
  If the wind will go down and the sky get quite blue.

M is the man who keeps crashing on landing.
  Why he won't flatten out passes all understanding.

N's the nacelle of a fast pusher scout,
  Twixt you and the earth, if you crash, there is nought.

O is hot oil, once it gets in your eyes,
  You will surely wear goggles at last and be wise

P is the prop which makes sticks which are sold,
  It has other uses as well I am told.

Q is the Quirk,‡ a machine of stability,
  Of peculiar design, but unbounded utility.

R is for R.A.F., who've designed a machine
  And an engine as well, such as never was seen.

S is for stunting, if done near the ground
  It's stupid and silly and grossly unsound.

T is the tarmac I stand on all day,
  And hope for a chair in an optimist's way.

U is the union of pipe and of tank,
  When the union gave way then the aeroplane sank.

V is for Vickers' gun, gruesome affair,
  Used to put wind up the Hun in the air.

W is washout, and wash-in as well,
  Their meaning's a secret I hardly dare tell.

X is the pilot, whose glory and fame
  We'll remember in England, though we don't know his name.

Y is the yell of a man (or its echo),
  Whose engine's gone dud for a long-distance recco.

Z is a letter of letters, my friend,
  It involves the word Zeppelin (this is the end).

* A term used to describe the B.E.2b.

† A term of endearment applied to all pupils under instruction in aviation.

‡ A term used to describe the B.E.2c.

TRADE CARDS.

TRADE CARDS.

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Tapes, Webs, Cords and Threads in all qualities, suitable for Aircraft Work. Delivery from stock.—John MacLennan and Co., 30, Newgate Street, London, E.C.1. (See Advertisement Page 701 and Buyers' Guide.)

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Model Aeroplane. — Flies ¼-mile, circular flight, 3s. 3d. carriage paid. "I can thoroughly recommend your machines." Testimonial from Dr. E. Adams, Union Road, Sheffield. Thousands satisfied. Testimonials from all parts.— Dept. C, Bristol Model Aeroplane Depot, Eastville, Bristol.

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Foreman required immediately for erection shop: must be good disciplinarian, tactful and used to handling men. Also two capable charge-hands. No one already on Government work will be engaged.—Apply giving age, experience, and salary required to your nearest Employment Exchange, mentioning this paper and Box No. 2029.

Splicer required for steel cables (aeroplane erection). First-class workman essential. No one already engaged on Government work or resident more than 10 miles away will be engaged.—Apply personally, or by letter to Works Manager, Handley Page, Ltd., Kingsbury Works, Edgware Road, Hendon, N.W.

Foreman wanted for aeroplane tank shop. Anyone already on Government work or residing more than 10 miles away need not apply. Lockwood, Brooksby Street, Islington, N.1.

Aircraft.—Required at once experienced assistant to develop designs under principal and work out stresses. Good salary and prospects. Apply Box No. 2032, THE AEROPLANE, 166, Piccadilly, W.1.

Sheet Metal Workers for aeroplane tank shop. Men on Government work or residing over 10 miles away need not apply.—Lockwood, Brooksby Street, Islington, N.1.

Wanted.—Thoroughly skilled craftsman with knowledge of seaplane float construction, also familiar with blue-prints, immediately, with a view to advancement as works foreman. Anyone residing more than 10 miles away or already on Government work need not apply. Apply John Ayers and Son, 8, Collier Street, King's Cross.

Experienced Erecting Shop Foreman wanted, must be a 6 o'clock-man and a good disciplinarian. Those engaged on Government work need not apply.—Write, giving particulars of experience, age, and wages required to nearest Employment Exchange, mentioning Box No. 2051.

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As Foreman. Covering and doping, thoroughly practical. Energetic.—Apply Box No. 2055, THE AEROPLANE, 166, Piccadilly, W.1.

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As Foreman. — Coppersmith sheet metal worker, 3 years' experience aeronautical work and drawings. Highest testimonials.—Apply "H," 29, Seven Sisters Road, Holloway, N.

As Works or Department Manager with good principle; experienced control and output; organiser, energetic, ineligible.—Apply Box 3033, THE AEROPLANE, 166, Piccadilly, W.1.

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Edited by C. Gordon Green

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ON MR. LANCHESTER AND HIS FRIENDS.

A PRELIMINARY SKIRMISH.

Some two or three weeks ago I promised to give myself the pleasure of replying to an attack on me and on this paper which appeared under the name of Mr. F. W. Lanchester. His article was prefaced by an editorial attack in the same paper, and, as Mr. Hilaire Belloc has been closely associated with the paper in question, I assumed at the time that the editorial attack was written by him. I find, however, on closer inspection that Mr. Belloc's name does not appear, so that perhaps he was not the author, therefore it must suffice to refer to Mr. Lanchester's advanced skirmishing line merely as the editor.

However, it seems that in the editorial view I have committed the deadly journalistic sin of having written two articles on the same subject—namely, the supply of aircraft, which articles appeared on the same Sunday, July 29th, one in *The Sunday Times* and one in *The Observer*. Not being a journalist myself, I confess to being unimpressed by the enormity of the crime, though it may be sufficiently irritating to a professional journalist who has failed to make good to find a mere amateur occupying the honourable columns of two leading papers on the same day. By way of consoling himself, presumably, this amusing editor says, "The only feasible explanation of the coincidence is that the editor of *The Observer* and the editor of *The Sunday Times* are both labouring under the same hallucination or delusion—to wit, that Mr. Grey is an expert whose dicta are reliable and trustworthy."

Happily, I have no claim to be considered an "expert," for on the subject of "experts" I entirely agree with General Henderson's famous definition,* consequently the jibe misses its mark. Following this, the editor says, "We have no doubt that the editor of *The Observer* and the editor of *The Sunday Times* acted in good faith, and in pure ignorance of the fact that Mr. Grey, like Mr. Pemberton-Billing and Mr. Joynson-Hicks, is not to be taken seriously."

To Be Taken Seriously.

So far as this last phrase is concerned, Mr. Joynson-Hicks succeeded before the war in convicting the then Secretary of State for War of making absolutely false statements in the House concerning the equipment of the R.F.C. He has since put forward criticisms which have later been proved to be correct. He has been elected chairman of the Parliamentary Air Committee, which is the strongest non-party organisation in the House. And he has been appointed by the Government a member of the Civil Aerial Transport Committee, of which Mr. Lanchester has also been similarly appointed a member, on which official reasoning Mr. Joynson-Hicks and Mr. Lanchester would appear to be equally worthy of being taken seriously—or not, as the case may be.

As regards Mr. Pemberton-Billing, his rôle has been that of the fanatic, whose self-sacrifice is a necessary ingredient in all reform movements, as history shows. But, at any rate, he fought and beat the whole force of the Coalition Government in two elections, and the Party organisers took him very seriously then. He occupied the attention of Cabinet Ministers, political agents, Secret-Service men, and Intelligence Department officials to quite a considerable extent, in the effort to discredit him in the eyes of the public, and the worst thing they could all rake up against him was the entertaining history of his variegated career in South Africa, which they duly published, greatly to his advertisement. And after that, in spite of playing his excellent cards badly through impatience with the political game, he forced the Government to form the Air Enquiry Committee, which, despite its limitations, did much excellent work and confirmed many of the criticisms put forward against the administration of the R.F.C. as it then was. Doubtless the reforms which followed the sittings of the Committee would have come in time, but they were certainly hastened by the agitations of the period. But in any case, one can scarcely argue, under the circumstances, that such a man was, and is, not to be taken seriously.

Lost Opportunities.

It seems, therefore, that this editor person has made a singularly unhappy choice of epithets in using the phrase "not to be taken seriously." There were half a dozen crimes with which he might have charged me more or less in common with the two members of Parliament with whom he has been pleased to associate me, but he has missed all his best chances. However, I am glad to see him admitting that "No editor is infallible, not even the youngest," for he may in future apply the phrase to himself instead of to those experienced publicists, the editors of *The Sunday Times* and *The Observer*.

An opportunity occurs for him to do so in his later remark that "Disraeli once cynically remarked at a Royal Academy banquet that the critics are those who have failed in literature and art." If I am not seriously mistaken, the sentiment was put into the mouth of a character in a novel called "Lothaire" by the author, Benjamin, Lord Beaconsfield. Probably none knew better than the noble lord the falsity of the innuendo,

*"Any plausible rogue gifted with sufficient assurance and aided by a ready pen or supple tongue has been able to pose as an 'aeronautical expert,' and to find some kind of following. To those who, as a matter of duty, or in search of information, have perused the aeronautical discussions carried on in the Press, or the reports of such discussions elsewhere, the very word 'expert' calls up a strange procession of inventors, politicians, motor-trade touts, journalists, trick fliers, novelists, and financial agents, most of them axe in hand on the way to the national grindstone."—(General Henderson's Preface to Mr. Lanchester's book on aeroplanes in war.)

or the truth of the more recent phrase of Mr. Ernest Newman to the effect that Nature can produce genius by the bucketful, but it takes time and experience to make a critic.

An Official Megaphone.

It may be that the editors of *The Observer* and *The Sunday Times* will feel proud of this anonymous editor's tribute that they "do not appeal to the illiterate and uneducated public . . . they appeal to the intelligentzia." Horrid word intelligentzia, and very reminiscent of Mr. Belloc and his would-be intellectual school of minor prophets, but let it pass. Also, a paper which appealed to the illiterate would be rather an interesting production. Anyhow, the trouble of the anonymous one is that the intelligentzia have "a weighty grievance" against these distinguished editors because they permitted me, an "exploded critic" and sundry other things, to criticise our system of aircraft supplies in their columns. Furthermore he asks that they shall allow their readers to hear the other side, according to Mr. Lanchester, "in view of the fact that the tongue of the other side is tied by official rules and regulations."

In view of the fact that "the other side" pulls all the official strings, can dope the Press into silence when criticism comes too near home, and can use such an effective megaphone as Mr. Lanchester, there seems little need for the plaintive appeal of the anonymous one. However, if "the other side" wishes to reply, either by the hand of Mr. Lanchester or in any other way, the columns of The Aeroplane are always at their disposal for the purpose. Personally, I rather regret that, up to the time of writing, neither of the two great Sunday papers has paid any attention to the attack, though one can quite understand their disinclination to trouble about the anonymous editor of a minor journal.

Both Barrels.

The last effort of the unknown one is a double-edged weapon. Under the heading of "The Deadly Parallel" he prints side by side two of my statements as they appeared in each of the Sunday papers. This first is the recognised Service proverb, "We are never less than six months ahead of the enemy in design, and never less than twelve months behind him in deliveries." The wording in each paper is identical, except that in *The Sunday Times* I wrote "our designs" and "our deliveries."

In the second paragraph I said, "R.F.C. pilots were still sent over the German lines on B.E. (officially designed) biplanes with 90-h.p. R.A.F. (officially designed) engines. At the present moment [July 29th, *bien entendu*, but perhaps not now on September 12th] there are 'chaser' squadrons—save the mark!—dying in France on Sopwith single-seaters with 80-h.p. engines. These machines are up against German reconnaissance machines of anything between 160-h.p. and 260-h.p." The parallel paragraph was identical in statement of facts, though the wording was slightly varied.

If there had been any divergence in the statements, the parallel would have been pretty deadly for me, I admit; but as they agree so closely, they appear to me to be rather like the two barrels of a double-barrelled gun in my hands. I can assure those who were so concerned at the time that there was no collusion between these two excellent papers. There seems no reason why the sportsman should let his right barrel know what his left barrel doeth, till they both go off together. The respective, and respected, editors each asked me in the same week for an article on a subject which was at the moment of public interest and was being publicly discussed by a number of people, and they got that for which they asked.

An Unaccustomed Phenomenon.

In any case, I defy the anonymous editor, or any other of Mr. Lanchester's friends, to disprove the facts stated in those deadly parallel columns. I can only suppose that the "deadliness" of the parallel in the eyes of my editorial critic consists in my having used almost identical words in two different papers. I am surprised—or, perhaps, as he is apparently a journalist, I should not be surprised—that he should object to two leading newspapers telling the truth on the same day. I admit that it may be an unaccustomed phenomenon in English journalism, but I cannot see that it is deserving of condemnation, or even of the mild form of semi-private pillorying provided by his journal.

MR. LANCHESTER'S SOLO.

We may now turn to the *pièce de resistance*, or main body of the attack, Mr. Lanchester's great solo, entitled "A Campaign of Slander." I wish it were possible to reproduce the whole of it in these columns, for Mr. Lanchester is always worth reading. Unfortunately he is as voluminous in his writing as I am myself, and there is not room for us both in the same paper at the same time. Therefore I am compelled to quote merely the main points of his argument, though I hope that I shall not omit any point of importance.

A Straight Offer.

It seems well, before proceeding further, to make to Mr. Lanchester this straight offer.—If at any time, now or hereafter, he wishes to attack me or any of my writings, the pages of this paper are entirely at his disposal. I wish to be perfectly fair to any person or any system criticised in this paper, and if Mr. Lanchester desires to write on behalf of the criticised I am prepared to give him these front pages which have been occupied since the foundation of The Aeroplane by my personal articles, so that his reply may have precisely the same prominence as my criticisms. Further, I give him my word that I will not exercise any editorial control over anything which he may write, and that I will not make any alteration in or addition to or comment on his writings. Any reply shall appear as a separate article over my own signature. And he shall have proofs of his own pages so that he can edit them himself.

Without any desire to boast about the circulation or influence of this paper, I think I may claim for it that it is more carefully read in the Flying Services and in the Aircraft Industry than any other paper. If not, I take it that people would not care whether I criticised them or not. At any rate, I can offer Mr. Lanchester greater publicity for his views than was afforded to him in the case of his recent attack.

Possibly my criticisms are affected by the fact that I see or hear only one side of the argument. Certainly Mr. Lanchester, judging by his writings, only sees the other side, and as one does not hear of Mr. Lanchester as a frequent visitor at aerodromes or at "trade" aircraft factories, it seems still more likely that his views are one-sided. Therefore, if we both state our views in the same place, our mutual audience is the more likely to arrive at the truth, which, I take it, is what Mr. Lanchester desires as much as I do. I assume that Mr. Lanchester, being a Government Official, as a member of the Government Advisory Committee for Aeronautics, and as a member of the Civil Aerial Transport Committee, has no personal or financial interest in any paper, and is therefore at liberty to set forth his views where he wills. However, there is the offer for Mr. Lanchester to take or leave as seems best to him. If I can be fairer than that, I shall be glad to know how.

"A Few Facts by Mr. Lanchester."

Mr. Lanchester is pleased to call my articles in *The Sunday Times* and *The Observer*, which were composed of statements already familiar to readers of this paper, "a venomous and unrestrained attack on the Air Board and upon the two branches of our Air Service, and upon those directly and indirectly responsible for their control." That is from Mr. Lanchester's point of view. From the other point of view they merely laid out a string of facts demonstrating how sins of the past have had their effect on the present, and where there is room for improvement in the present system. So far from being an attack on the Air Board, they were, on the contrary, calculated to assist the Board by pointing out certain matters which those at the top end of what Lord Sydenham has called "the chain of responsibility" would be unlikely to learn through so many intervening links. Mr. Lanchester would have been nearer the mark in calling them an attack on those who *have been* responsible for the control of the Flying Services in the past.

The Wily Red Herring.

Mr. Lanchester either confuses the issue in his own mind, or purposely endeavours to draw a red herring across the scent, by calling the articles "a renewal of the Billing-cum-Joynson-Hicks-cum-Grey attacks of some twelve months back." There is no reason for dragging Mr. Joynson-Hicks or Mr. Billing into the argument at all. The articles were mine, and no other person had anything to do with them. If some of the criticisms were similar to those expressed by others, they can only have arisen from the same root-cause of complaint. Because Mr. Billing has contrived to make himself unpopular with certain classes of the community, while gaining popularity with others, it may be a good move in controversy to link his name as closely as possible with those of other critics in the hope of discrediting the whole bunch, but if Mr. Lanchester himself wishes to be taken seriously he should be above such political trickery. And, anyhow, why stop at Mr. Billing and Mr. Joynson-Hicks? Why not drag in Lord Montagu and Lord Sydenham, and Mr. Ellis Griffiths and Sir Henry Dalziel, and Colonel Faber and Major Burgoyne, and all the rest of the critics?

When Mr. Billing was fighting the Mile End and the East Herts elections, and was being misrepresented by the Government-inspired Press, I supported him because he deserved support, apart from a very natural sympathy for the under dog, and I have supported him, and other members of Parliament, when their criticisms were well founded. But I have not done so when the criticisms were on the wrong lines, or were not deserved.

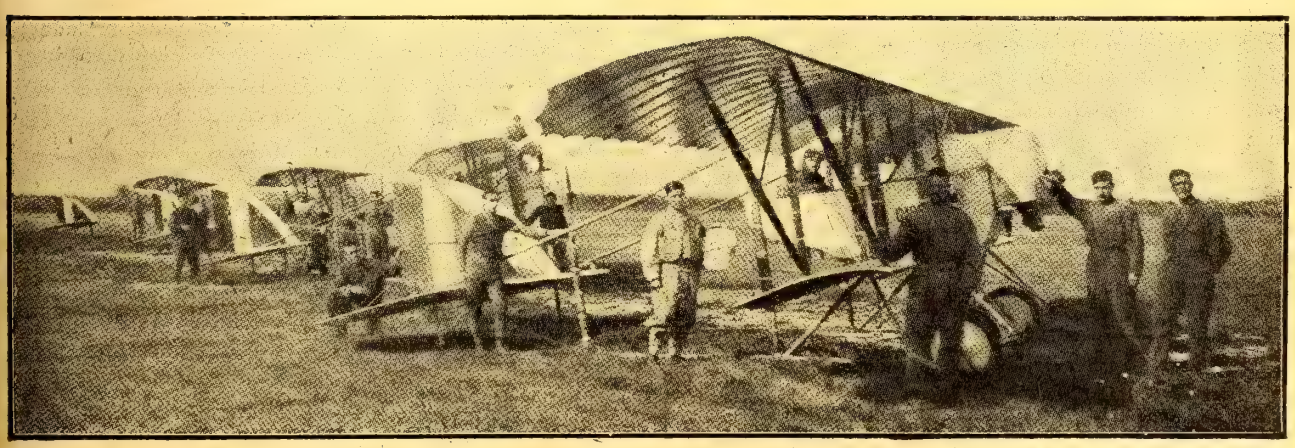
Mr. Lanchester refers to "the exposure of Billing" in the *Daily Chronicle*. Does Mr. Lanchester know how the South African history of Mr. Billing was obtained and how it was conveyed to the *Chronicle*? If so, would he like to describe the operations in this paper? He is quite at liberty to do so if he dares. And perhaps he will also specify what there was discreditable in the so-called "exposures." If history does not lie, the youthful adventures of the late Lord Strathcona and of the very present Sir Eric Geddes were among people at least as humble in station and were nearly as variegated.

The Air Enquiry Fallacy.

Mr. Lanchester makes much capital out of the fact that before the Air Enquiry Committee "it soon transpired that neither Billing, Grey, nor even Joynson-Hicks were able to produce evidence in support of their wild and reckless assertions and accusations." Permit me to remind Mr. Lanchester that only plaintiffs or defendants in law "produce evidence." I personally appeared before that Committee simply to indicate directions in which reforms were needed. All those who appeared before the Committee were officially called "witnesses," and witnesses do not produce evidence, they merely state what they know or believe to be true. Even the Committee itself was not empowered to subpœna witnesses, nor to take evidence on oath. Therefore, Mr. Lanchester's jibe about not producing evidence is merely another attempt to sidetrack the issue. Logically his argument is bad, for he is guilty of begging the question. Nevertheless, it is well to point out that the final report of the Committee agreed to an unexpectedly large extent with the criticisms of those who appeared before it.

A Personal Point.

Referring to me personally, Mr. Lanchester says, "He abandoned his charges without offering a tittle of evidence," and quotes from *The Times* report as follows: "Mr. Grey under cross-examination was asked whether he might take it that the charges against the Royal Flying Corps other than those now made by witness were dropped. No answer was given to this question, and the Chairman remarked that the charges did not seem to be persisted in now." *The Times'* report, albeit execrable grammar, is substantially correct as a statement of what occurred. But it may be well to explain that I went there as a witness and not as a prosecutor or plaintiff. I went prepared to answer questions, not to make charges. When challenged by the chairman to make charges, I laid down briefly some general criticisms of the administration of the R.F.C.



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OUR ITALIAN ALLIES.—A group of Caudron Biplanes in use at one of the Italian training grounds.

as it then was. After spending so much time before the Committee, and after seeing the lines on which the enquiry was being run, it seemed to me to be useless to waste any more of its time, for it was obvious that no evidence, in the proper sense of the word, could possibly be produced by anyone. So I simply shut up, and left the Committee to draw what conclusions it pleased. But, let Mr. Lanchester and his friends clearly understand that I was not there to make "charges," and did not make any.

There is a vast difference between a charge and a criticism. For instance, I might legitimately criticise Mr. Lanchester's ideas on aero-engine and aeroplane design, as exemplified by his attempts to produce an aero-motor at the Daimler works and a chiefly-steel aeroplane at Bognor, both of which failed to function, but I should never think of charging Mr. Lanchester with deliberately wasting somebody else's money in building that machine and that engine.

Those "Murder Machines."

Referring to Mr. Joynson-Hicks, Mr. Lanchester says, "The resilience of these *soi-disant* reforms [presumably a misprint for reformers] is truly amazing! We find him once more talking of 'murder machines,' a term borrowed from one of the grossest of the Billing charges, and which had received the unreserved condemnation of the Court."—I do wish Mr. Lanchester would avoid split infinitives, inconsequent "and whiches," and unsupported final prepositions. They quite spoil what would otherwise be a very effective style in Philippics.—However, what I was going to say is, Why does he again attempt to link these two Members, and why does he so carefully avoid mentioning that the "murder" epithet, which seems to catch officialdom so badly on the raw, was originated by that excellent old-school Tory, Captain (now Colonel) Walter Faber, M.P., in early 1913? What grounds has Mr. Lanchester for saying that Mr. Joynson-Hicks borrowed it from Mr. Billing rather than from Colonel Faber?

"Ha! Ha!" said he. "A Trap!"

On another point Mr. Lanchester displays unnatural innocence. He says: "There is one fact that shows up prominently when the various attacks and accusations are examined. Their authors (in the present case Mr. C. G. Grey) are wily enough to avoid putting them in a form which would permit of their being challenged in the Courts. The accusations *are never made against individuals* or in such a manner as would enable the parties attacked to bring an action either for civil or criminal libel to establish the truth."

Now in the first place, the majority of my criticisms have not been directed against individuals, but against a system. If the present Air Board, or some future Air Minister, is strong enough to break up the old system and set up an improved one, well, good luck to them, it or him, as the case may be. None will be more ready to support them than I. On the other hand, there have been instances in which I have been "wily enough to avoid" libels, for the very good reason that though, with the ability to *subpœna* witnesses, certain criticisms could have been proved up to the hilt, there is such a trick as shutting up critics by bringing an action for libel and then skilfully deferring the hearing of the case month after month till the reason for the criticism has been abolished, or the interest which made it of importance at the moment has died of old age.

SOME OFFICIAL PRONOUNCEMENTS.

Proceeding further, we find Mr. Lanchester saying, "In the present recrudescence we have C. G. Grey forced to admit the eminence of the Royal Flying Corps, but he represents its position as maintained in the face of the enemy in spite of faulty *matériel*, rather than on account of our technical mastery. No one, not even Mr. Grey, will grudge our gallant flying men their meed of honour and appreciation."

Quite so, but why the "not even"? None honours and appreciates the gallantry of our active service aviators more than I do. Once upon a time I even dared to write a book about them and their doings. However, let us consider the other points, in the light of official pronouncements, which I take it may be considered as evidence, even in a Court of Law.

In the *London Gazette* of December 29th, 1916, appeared the end-of-the-year dispatch from Sir Douglas Haig, dated G.H.Q., December 23rd, in which he said: *"I desire to point out, however, that the maintenance of the mastery of the air, which is essential, entails a constant and liberal supply of the most up-to-date machines, without which even the most skilful pilots cannot succeed."*

Now General Officers Commanding in Chief do not put striking phrases into their most important dispatches purely for fun. If that phrase means anything at all it implies a warning for the future. And such a warning would not be thought necessary unless the experiences of war had shown it to be necessary. In plain language any ordinary man would take it to mean "We have the best pilots in the world, but we must have more and better machines." If it does not mean that we were then holding our position because of the skill of our pilots, "rather than on account of our technical mastery," perhaps Mr. Lanchester will explain what it does mean.

The Truth from the Treasury Bench.

Next we come to March 7th, when Sir Henry Dalziel asked in the House "whether we still maintain the mastery of the air on the Western Front?" Mr. MacPherson, that most honest and straightforward of Ministers, replied "I think I can give that assurance"—a reply which produced exclamations of "Oh! Oh!" from various parts of the House.

On March 21st—just on three months after Sir Douglas Haig's dispatch was written—Sir Henry Dalziel asked the same question again. This time Mr. MacPherson replied, "The situation is similar to that which obtained at the same period of last year, when at that time the Germans, reinforced and rested during the winter, put up a serious opposition."

Those who remember what things were like on the West Front early in 1916 and late in 1915, will realise what such an official admission meant. At the very best it meant that Sir Douglas Haig was not then obtaining his requirements, which would have made the mastery in the air possible. Which seems to justify the criticisms and to condemn the administration which was responsible for such a state of affairs.

Then we come to the Easter period when 28 British machines were officially logged as "missing" on April 7th, and 49 were officially admitted to be "missing" between April 3rd and April 9th inclusive, without counting those shot down on our side of the lines, or crashed on returning.

Though not an official pronouncement it is worth while quoting "C. W.," of *The Observer*, who wrote on April 8th, "There is a widespread conviction that the Air Ministry has not even yet succeeded in putting on a proper basis the manufacture and delivery of the fastest and highest climbing aeroplanes, and that the old evil of preference for Government-designed machines and engines still exists." He referred also to "un-

businesslike and wasteful contracts," and to "aeroplanes of proved inferiority being made in large numbers." And he wound up by saying, "All these questions demand an immediate answer, or the present authorities will wake up one morning to find that an impartial investigation is being conducted over their heads." I do not know who "C. W." may be, but he nearly always writes sense, and never more so than in that article.

Only a few days previously, on April 4th, Mr. Winston Churchill, speaking on the Air Board and the situation generally, blamed the House of Commons "for relaxing its vigilance and for being so easily put off." "Never since the battle of the Marne," said he, "has the situation been more serious than at present." These were unofficial dicta, but they did not draw down the wrath of Mr. Lanchester and his friends as my two articles did. Why?

An Illuminating Admission.

Proceeding, we come to April 25th, when Major Baird, Parliamentary Secretary to the Air Board, and therefore presumably in possession of the facts, admitted in the House that *B.E.2cs, B.E.2ds,* and *B.E.2es* were still used over the enemy's lines. The following day, April 26th, Major Baird, right at the beginning of his long speech, referred again to the various B.E. types, and said, *"I do not deny that if they* [C.Os. on active service] *had other machines they would send them out in preference."*

Now that was precisely the state of affairs against which all my criticisms have been directed ever since the war began. We might have had "other machines," but for the very system and the very people which and whom Mr. Lanchester is so concerned to defend. The fact that so many sudden and violent changes in the personnel of the production departments occurred in or about or after that period surely shows that the criticisms were well directed and justified.

In the three months between that date and the writing of the offending articles in the Sunday papers a great deal has been done to improve matters in many directions. Mistakes have also been made, and mistakes seem to be legitimate grounds for criticism. But when possible that criticism has been of a purely friendly nature.

SOME OLD CONTROVERSIAL POINTS.

The next section of Mr. Lanchester's article is devoted chiefly to extolling the properties of the B.E. series. He assumes, entirely without grounds, that "the existence of the official design" is the "key to the whole attack." The real reason for the old attacks was the unfair preference given to official designs, both in machines and engines. There is no room in which to go over the whole of that ancient history again. One can only say that it is unfortunate that official designers never gave one an opportunity of acclaiming their pre-eminence, for at no time has the best official design had a performance equal to that of the best contemporary unofficial design of similar type. For instance, the de Havilland 1 had a better performance than the F.E. with a similar engine, and the Armstrong-Whitworth with a 90-h.p. R.A.F. had a better performance than the B.E. of its period. Yet the available engines were ear-marked for B.Es., the de H.1 was washed out, and the A.W. had to be faked up to take an engine for which it was not designed, and was naturally spoilt in the process.

The ancient criticism of the B.E.2c., when it was new, was not so much that its performance was bad, though others were better, but that its detail design was so complicated that it cost far more than it need have done in labour and material. There is precisely the same objection to the S.E. to-day. It simply means that we might have had more aeroplanes in the same time if these machines had been designed by people with knowledge of quantity-production gained in workshops, and not merely from books.

A Wholesale Condemnation.

The most damning criticism of the old administration is found in Mr. Lanchester's own words when he says, "The B.E. type, of which the B.E.2c. is (if one may say so) the hack machine, and as such, the backbone of the reconnaissance service, has held that position for the whole three years of the war." What can one think of an administration which so arranged things that a machine had to be used for at least two years after it became out of date? Can one be surprised at Sir Douglas Haig's plea for a supply of the most up-to-date machines?

Later, Mr. Lanchester says:—"It has been called a murder machine, because it was not quite equal in speed or climb to some of the enemy's specialised fighting scouts (the Fokker, for example)." "Not quite," is fairly cool, considering that the machine was absolutely outclassed.

And here, let me remind Mr. Lanchester, that the "murder machine" phrase came into common use early in 1916. At that date the French had already bought the "1½ strutter" Sopwith (their first order was placed on December 20th, 1915). The first 1½ strutter appeared in June, 1915. To-day the German lists of British machines which have fallen into their hands show that they are still bringing down Sopwiths of that 1915-16 type, now towards the end of 1917. And, according to Mr. Lanchester, the 1914-15 type B.E.2c. —plus a more powerful engine admittedly, though, even so, only a 90-h.p. against the German 160-h.p.—

Reproduced from "La Guerra," the Italian Official Publication.

OUR ITALIAN ALLIES.—A group of officers and men at one of the Italian training schools, with one of the school Caudrons.

is still "the backbone of the reconnaissance Service." Does Mr. Lanchester seriously mean to defend an administration which left such a legacy to those who are trying so hard to put things right to-day?

One seems reasonably justified in assuming that if others had had the thousands of pounds which were poured out on the R.A.F. before the war, while the "trade" was left to starve, we should by now be far ahead of the enemy in every way.

Mr. Lanchester's Impartiality.

A little further on Mr. Lanchester says:—"I have broadly nothing to say against proprietary designs." One notices, however, that Mr. Lanchester has had little or nothing to say *for* them. In his various lectures to learned societies his illustrations have been almost entirely confined to R.A.F. products. The last book he published contained many photographs of officially designed machines, and, unless my memory plays me false, only one of a "trade" design, which was shown upside down, as the result of an accident. Such a curious selection may have been unintentional, but, if so, it was a singularly unfortunate attempt to suggest impartiality.

He continues: "There have been many very good machines designed and produced by our privately owned factories, and the country has much for which to thank those who, by their enterprise and perseverance, had established these factories prior to the outbreak of war." For such condescension, even if it be not damning with faint praise, the "trade" will doubtless be duly grateful, seeing that it comes from a member of the Government Advisory Committee for Aeronautics.

A Challenge.

After which, he says:—"But I do know enough about these private factories and their personnel and the machines they produced to be able also to state without hesitation that it is well for us that we are not entirely dependent upon them for our designs and output, and, above all, for our technical knowledge."

Now here is an excellent opportunity for Mr. Lanchester to prove at once his moral courage and his own knowledge. Let him give his reasons for such a statement. Let him boldly name names and give specific instances in proof of his assertion. He twits me with being wily enough to avoid putting charges in a form which would permit of their being challenged in a Court. He, however, will be in no danger of a libel action if he departs from the vague generalities of this and his succeeding charges against the Aircraft Industry. He can make his specific charges of incompetence in this paper whenever he pleases, and by doing so he will certainly assist in educating the Industry, if only in its knowledge of the competence of the Government Advisory Committee for Aeronautics.

Pilots as Judges.

On one point I agree entirely with Mr. Lanchester, that is when he says:—"Personally, I think that far too much weight is often given to the chance and ill-considered opinion of pilots, often men whose training is not even complete, of quite narrow and limited experience, writing under the stress of a hairbreadth escape or other untoward experience."

Personally, I always weigh a considerable amount of evidence before venturing to criticise any type or system. One of the faults of the old administration was that there was too much tendency to adopt or condemn a machine on the opinion of a few paid official testers or of Service pilots, who had had little or no experience of the best "trade" machines, who had every incentive to stick up for the official designs, and who occasionally had very definite prejudices against "trade" machines. To-day the situation is rather different, but the continued use of the R.E.8 seems to be a case of giving weight to the ill-considered opinion of pilots, in that a man who has never flown anything better than a B.E. naturally feels pleased with the performance of an R.E.

I wonder, by the way, whether any independent firm has ever been given one of the engines used in the R.E.8, with instructions to see what sort of machines it can produce for the same military purpose. I do not happen to know of such an experiment, and if it has not been tried, it might be worth while to try it, just to see whether as good a performance, or even better, cannot be got without the particular defects of the R.E.8.

A Side Issue.

Mr. Lanchester devotes considerable space to a letter read in the House of Lords by Lord Montagu relating to the destruction by a storm of a de Havilland squadron when starting for France early in 1916, though what it had to do with the present argument is hard to discover. However, it may be well to explain, as Mr. Lanchester does not do so, that the mishap occurred through inexperienced pilots starting out on machines to which they were unaccustomed. It had nothing to do with the machines as such, and Lord Montagu's criticism was directed at the sending out of pilots without sufficient training on the machines which they would have to fly on active service.

This trouble—caused chiefly at the time by the pressing demand from the front for more men and more and better machines—is not likely to occur in future, and it would not have occurred then but for the mistakes of the previous years.

A RETURN TO MODERNITY.

Thereafter, Mr. Lanchester returns specifically to the Sunday paper articles, and points out that "we may, at least, rest satisfied that in the hands of such thoroughly experienced men as Sir William Weir and Mr. Percy Martin the possibilities of utilising to the full the manufacturing resources of the country are not being neglected." With which, of course, everyone will agree. At the same time, neither Sir William Weir nor Mr. Martin can be everywhere at once, nor can they see personally to everything which the various departments and sub-departments under them are doing.

Some of those departments are extraordinarily well run. Some of them are quite up to any reasonable average of efficiency. And some are, undoubtedly, bad. It seems very unlikely that either of the officials mentioned will resent having their attention drawn to the bad spots. If they already know where trouble exists, and are already putting it right, criticism can do no harm; and, if they have not yet discovered the whereabouts of the trouble, criticism may help them to find it. All who have had dealings with the Air Board speak in the highest terms of the efforts which are being made by the Controller of Aeronautical Supplies, and I, for one, have the keenest possible desire to help whenever possible. Surely, pointing out weaknesses is one good way to help towards strength.

A Matter of Evidence.

Mr. Lanchester seems annoyed because in these articles when writing of squandering our resources "no evidence is offered; we are asked to take it merely on the assertion of the writer of the article." If Mr. Lanchester will do me the honour of reading The Aeroplane for the last few months he will find, if not legal evidence within the meaning of the Act, at least statements as to how waste is caused, which statements

should be sufficient to put him on the track towards finding evidence.

Unfortunately, neither the editor of *The Sunday Times* nor of *The Observer* saw fit to place at my disposal unlimited space in which to go into details. At any rate, the whole "trade" agrees as to inefficiency of production caused by "scrapping."

Back to Ancient History Again.

Referring to my statement that "Our aviators are to-day paying for a policy which before the war refused orders for British-built aero-engines, and bought engines from France pending the production of a wonderful engine from the Royal Aircraft Factory, which was to be the standard engine for the Service," Mr. Lanchester says: "Admittedly, the orders placed for aero-motors were very limited; they were regulated by the number of aeroplanes, and this by the establishment, as determined by the money available."

That, of course, is true, so far as it goes. As Mr. Lanchester admits, "In the matter of aero-motors the French held the lead, and it was more than difficult to interest British motor firms in the aero-motor; that I can vouch for as a matter of personal experience." Naturally; because motors were ordered from France, so that the Services could carry on their work, and what was left of the money was spent on the R.A.F. and its experiments.

Small wonder that British motor firms were not interested, when there was no assurance of orders. Naturally, capitalists were shy, and only enthusiasts continued to experiment. And will Mr. Lanchester explain why, when Mr. Holt Thomas offered in 1913 to start building Gnômes in this country if assured of an order for only 50 engines, such an assurance was refused him, although many more than 50 Gnômes were bought from France before the war?

Comparative Opportunities.

It would be interesting if Mr. Lanchester, with his inside knowledge, would make it known how much money was allotted to the R.A.F. before the war, and spent on R.A.F. designed machines built by contractors, and how much was spent on British-built aeroplanes and engines of "trade" designs—excluding, therefore, machines of R.A.F. designs built under contract.

Is Mr. Lanchester seriously of the opinion that, if the R.A.F. had been tied down to the same money as were the private firms, and if it had only had the same prospects, it would have done as well? Would they have got as far as, say, the 80-h.p. Avro, or the 80-h.p. Sopwith two-seater, or the Roumanian Coanda-Bristols? And even with all their extra thousands, and their certainty of more thousands of their Treasury grant to come regularly every year, even if they produced nothing worth having in one year, how much further did the R.A.F. really get?

It may be well to recall that M. Blériot built 12 machines and spent £40,000 in experiments before he flew the Channel (on Blériot XI), so it may be seen how little chance the British constructors had.

HISTORICAL INACCURACIES.

In the face of all his support of official actions, Mr. Lanchester says:—"The fact that the enemy possessed at the outset an engine of more powerful type than our own, and the equipment for its manufacture, had its origin in the enterprise which the German nation and the German Government prior to the war had for years been showing in the development of the Zeppelin airship rather than any particular foresight in the matter of aeroplane development." This in itself is an admission that our official people did not take aeronautics in general seriously, but even so, Mr. Lanchester is right off the rails of fact.

Has he ever heard of the *National Flugspende* of 1913, when hundreds of thousands of pounds were collected, with the backing of the German Army, solely for prizes in aeroplane competitions? Has he ever heard of the officially organised Prinz Heinrich aeroplane tours, combined with competitions at the various controls, in which officer aviators were encouraged to compete with professionals for prizes given by the Imperial and State Governments? Has he ever heard of the Kaiser Preis of 1913 for aeroplane engines, with the supplementary prizes given by the War Ministry and the Ministry of Marine? As a matter of fact, the Benz and Mercédès aeroplane engines had nothing to do with the Zeppelin engines, which were Maybachs of quite different type

Comparative Performances.

It is true that, as Mr. Lanchester says, "In the early stages of the war our machines were putting up a performance equal to the enemy machines on far less horsepower," but our people, apparently, were only up against the old-fashioned four-cylinder 75-h.p. Taubes and such things. German biplanes were scarce on the West front for quite a time, probably because most of the best German machines had gone East to patrol the vast areas attacked by the Russians' immense armies.

At any rate, we know that before the war the Germans possessed many aeroplanes far better than anything they produced on the West front for a long while. Reference to German records for duration, distance, height, and speed just before the war prove that much clearly enough, and a friend of mine, who was at Johannisthal two days before war was declared with England saw a dozen Albatros biplanes start in one bunch for Vienna, *en route* for the Russian front.

All of which was directly due to German military encouragement of precisely the kind which was lacking in this country.

Those Streamline Wires.

Mr. Lanchester is bold enough to claim for the "official designer" much of the aerodynamic efficiency of our early machines, and adds: "Of the various individual items of improvement . . . none has had so great an influence as the streamline wire, otherwise known as the R.A.F. wire, and the advantage was demonstrated at Farnborough beyond dispute as adding *several miles per hour* to the speed of the machine."

Against this, I would point out that an R.A.F. wire is only approximately a streamline when a machine is at its absolutely correct flying angle. When a machine is sagging about near its "ceiling," streamline wires must increase, instead of decreasing, its head resistance, and, similarly, when it is diving past its proper flying angle. The mere howling of streamline wires under certain conditions seems proof positive that they waste power, for the vibration which causes the noise must be caused by air resistance. Also, they are dangerous, because of their liability to breakage owing to vibration, they are costly in labour and material to produce, and they produce a high proportion of scrap in manufacture.

Whatever advantage they do give, when flying at their one correct angle, it seems at least probable that as great a saving in head-resistance can be effected by using two plain wires or cables, with a flitch of wood between. Where the R.A.F. wire really scores is probably because its end-joints are neater than the ordinary loops or splices, which, where several wires end at the same point, set up an ugly bunch of resistance.

One of our most successful of aeroplane designers has steadfastly refused to fit R.A.F. wires, and yet his machines do their performance quite satisfactorily, and I know the pilots feel happier on them. There is just the possibility that R.A.F.-wires may be worth while on a very small fast machine, though even there I can put one or two highly successful aeroplane designers up against Mr. Lanchester—who cannot, unfortunately, be called a successful aeroplane designer—but on a big machine with long stretches of wire there seem to be better ways of getting performance than by using these so-called wires, which are really swaged rods, and, therefore, unsuited to stand vibration.

QUANTITY PRODUCTION AGAIN.

Mr. Lanchester assumes that "Mr. Grey has evidently had no experience of quantity production, otherwise he would know that it will always be the case, so long as there is progress, that the latest and best designs will not be available in sufficient quantity." It all depends what Mr. Lanchester means by experience. I do not suppose that anyone in this country knew very much about quantity production before 1895 or so, and I had a fair amount of factory experience in those days. Mr. R. F. Hall's equipment of Cleveland screw machines, at his original Stellite Works, was, at any rate, something of a novelty even in 1896. And, so far as my recollection of the motor trade goes, I cannot recall that Mr. F. W. Lanchester in the rôle of workshop boss was any great success as a quantity producer of the tiller-steered, double-opposed-horizontal-engined horseless carriage which he designed some years later. It so happens that until a matter of eight or nine years ago I made a more or less honest living by doing things instead of merely writing about them.

Anyhow, be that as it may, I am not so out of touch with productive methods as to imagine that the newest and best machines can be produced in quantities immediately the first of the type has been accepted as suitable for service. All I have asked is that the decision as to whether a type shall or shall not be accepted shall be made as quickly as possible, and that when accepted it shall be reproduced as quickly as possible.

Modern Improvement.

Things are improving rapidly in this direction under the existing administration. Consider the B.E.2c. produced in 1914, and still in use; or the "1½ strutter" Sopwith produced in June, 1915, ordered in December, 1916, still built in quantities in 1917, and still in use; and compare these with the handling of certain more recent machines, which must be nameless, which only appeared for the first time a mere six or eight months ago, and are now coming through in quantities. We may yet hope to arrive at the time when a new machine officially adopted one day may begin quantity deliveries six weeks later.

That appears to be the limit for quantity production, so far as my aeroplane workshop knowledge goes. And I doubt whether Mr. Lanchester, for all his professorship, and his Government appointments, and advisory posts, has seen very much more of the inside of successful modern aircraft factories than I have—or is personally acquainted with more works managers and other practical aircraft producers than I am.

Anyhow, on the question of quantity production I should like him to compare the detail designs of any of the officially designed series of machines with the details of any of the successful trade-designed machines, and then give his honest opinion on the two.

The Treatment of Obsolescence.

Mr. Lanchester is further pleased to take me to task for suggesting "Ruthless scrapping of obsolescent designs, and immediate cancellation of all contracts for such designs, followed by immediate placing of contracts for new designs," and asks, "Does Mr. Grey suggest that it will facilitate the efficiency of the R.F.C. or the R.N.A.S. to deprive them of some of the supplies for which they have arranged to take delivery?" Frankly, I do not know what Mr. Lanchester means by "facilitate the efficiency." I suppose he means "maintain" or "increase" efficiency, but facilitating efficiency is beyond my comprehension. Also, I suppose, he meant to write "*of* which they have arranged to take delivery." Anyhow, when I wrote designs I meant designs, and not, as Mr. Lanchester seems to think, machines already in existence, or partly finished.

In other words, I meant that when a better machine for a certain purpose is produced, and is accepted by the technical staff of either Service, existing machines for that purpose become obsolescent—though not absolutely obsolete. Therefore, instead of going on building them—as, for instance, building B.E.2cs. in 1916-17, "1½ strutters" in 1917, and de Havilland pushers, and F.E.8s, and R.E.7s, any time up to the end of 1916—the designs should be scrapped, so far as fresh orders are concerned, existing contracts should be cancelled, so far as the portions on which work has not been started are concerned, and orders for the new type should be placed immediately so that there may be no cessation of work. Does Mr. Lanchester quarrel with that suggestion?

One cannot explain all these details in the limited space afforded by a non-technical paper, such as *The Observer* or *The Sunday Times;* one has to rely to some extent on the intelligence of one's readers. Apparently, Mr. Lanchester, judging by his own fondness for elaboration of detail description in his lectures and writings, has never been faced with the trouble of dealing with a large subject in a small space, and I can promise him that if he cares to continue in this paper his attack on me, or if he cares to answer the various questions I have asked him, he shall have all the space he wants, in which he can be as prolix as he pleases, and as abusive as he likes, even if I have to publish him as a serial story or a feuilleton.

A Little Encouragement.

When he refers (in italics) to one of my statements as *"The bald assertion of a self-appointed critic, unsupported by any evidence whatever,"* he rather amuses me, for I have never yet met a critic who was appointed by anyone other than himself, nor do I recall a critic who quotes examples to support his case to a greater extent than I do, when space permits. I feel sure that Mr. Lanchester can do better than that in the way of opprobrious epithets if he really tries, and I do hope he will accept my invitation to use The Aeroplane as the rostrum for his next oration. It is a pity that he should waste his sweetness on the desert air of a minor publication.

Besides, if Mr. Lanchester were not several Government officials rolled into one, and a mathematician, and an advisory expert, and several other equally exalted things at the same time, I believe we might be quite good friends, for we have several qualities in common besides prolixity—for example, we hate our friends' enemies so heartily, even when we do not know anything about them personally.

Meantime, I apologise to my readers for taking up so much space, for which they pay, with what is in fact a personal argument between Mr. Lanchester and myself, and I promise not to offend again to the same extent.—C. G. G.

THE ROYAL FLYING CORPS AID COMMITTEE.

Subscribers and donors to the funds of the Royal Flying Corps Aid Committee, over which Lady Henderson presided, have received a circular containing an abbreviated copy of the report presented on July 2nd, 1917. It outlines the work done by the Committee during the seven months ending December 31st, 1916, which includes the sending of small individual parcels periodically to every man in the R.F.C. in France, Mesopotamia, Africa, the Balkans, Egypt, and India. These parcels contain various small comforts not included in Army issues. In addition, a large number of garments have been sent out in bulk.

A special feature is the sending of parcels to prisoners, both officers and men, containing food and various other home comforts. In this connection it may be well to point out that private individuals are not allowed to send parcels to prisoners, and therefore the friends of officer prisoners may be glad to avail themselves of the aid of the Royal Flying Corps Aid Committee in getting necessaries to their friends. Naturally, when circumstances permit, the Committee are always glad to receive donations to cover the cost of sending parcels to any particular individual. At the time of the issue of the report 387 officers and 40 N.C.Os. and men of the R.F.C. were known to the Committee as prisoners in Germany, and practically all are recipients of regular parcels, chiefly containing food.

One notes from the report that of the many officers in the R.F.C. with whom the Committee have got into touch, only three or four have died in Germany through wounds, which seems to indicate that they are being well treated by their captors. Communication with prisoners in other countries is much more difficult, but every effort is made to keep in regular communication with every known prisoner, no matter in what country he may be.

Owing to the high cost of printing, it has been deemed inadvisable for the Committee to incur the expense of printing a list of subscribers, but those interested may consult a list at the offices of the Committee.

Now that the R.F.C. has increased so greatly in size, the effort to keep the whole of the personnel supplied with home comforts during the forthcoming winter will tax the efforts of the Committee very seriously, and they hope that those who have previously subscribed will feel able to renew their support and that new friends will come along to swell the coffers.

Donations in cash and kind should be addressed to the Fund at Surrey House, Marble Arch, London, W.1.

In conclusion one would like to point out that the receipts and payments made during the seven months under review show that an extremely small proportion of the Committee's funds have been expended in administration. Goods to the value of £5,800 have been purchased and distributed for a matter of £350, and naturally this amount includes the expense of distributing a large number of garments and other goods donated in kind.

LORD MONTAGU AND AIR RAIDS.

Lord Montagu of Beaulieu, opening Lady Drogheda's Air Service Exhibition at Sheffield on Sept 7th, said they owed a great debt to the Air Service for the immunity they now enjoyed. The Zeppelin peril now appeared to be passed, but a new one confronted them—that of the aeroplane by night.

In regard to the conditions at the various fronts, he was able to tell them that in man-power and money-power the Allies were still superior to the Central Powers, and even if Russia no longer helped, though he did not despair of its recuperation, it would not by any means follow that Germany could win. It was, however, his firm personal conviction that our victory when it came would be from the air. On all fronts there was stagnation of infantry, while the flying forces were doing nearly everything that the rest of the Army could do. The direction and observation of artillery, not less than scouting, were almost entirely done by aeroplane, and he said deliberately that no Army could attack, pursue, or achieve complete victory without its flying corps.

They heard a good deal about the recent bombing of London districts and certain places in the South-East corner of England, but he thought it was necessary to retain a proper sense of proportion about those matters. He had ascertained that so far the casualties resulting from aeroplane attacks since January 1st totalled less than 2,000, the exact figure he believed being 1,650. Compared with casualties at the front such a figure was absolutely negligible. Deplorable though it was that civilian lives should be so sacrificed, he did not believe the English people were going to be so craven-hearted as to desire to deplete the Air Service at the front in order to protect lives at home, because, after all, in a military sense, civilian lives were of much less account than those of our fighting men.

He did not deny that home defence was a very important matter, and especially that London, the nerve centre of the war, should be protected as far as possible. He had never minimised the risk of bombing raids causing fire, and if no panic, at any rate a resentment and feeling that all possible had not been done to protect the population at home, but what was the real truth of the matter? He could assure them that we in common with our Allies, and he knew also the same thing applied to Germany, had not got enough aircraft to do the work which they desired of them, and there was a shortage of machines. He was not discussing the responsibility for that, but the fact must be faced that we could do with double as many aeroplanes as we had got. He could, however, tell them a piece of comforting information, that the Government and the two Air Services were doing their best to remedy that shortage.

With the possibility that the enemy might be relieved of Russian pressure, and thus be enabled to bring more pressure to bear upon us, he appealed to those engaged in aeroplane construction for God's sake, and for the sake of our gallant men at the front, not to let any domestic disputes hinder the output of aircraft. The wastage in aeroplanes was far greater than the man in the street had any conception of, and we must produce immense numbers in excess of the number yet contemplated. Our pilots compared well with those of any belligerent nation. But fine as they were the people of this country must be warned against clamouring for the impossible. When air raids took place there was a great danger that demands would be made that our aviators should go up on what he could only describe as a wild-goose chase. Could they imagine what chance of success a man had, going up on a dark night, when he could only see lights below and the stars above, and hear no sound but the noise of his own machine? Even if he should chance to see another aeroplane he had to discover whether or not it was an enemy. The difficulty was immense and personally he regarded it as a waste of the man's life and of the machine. What should be done, and what was being done, was to bomb German aerodromes at the front and bomb their towns behind the lines. (Applause.) To harass the wasps' nest instead of trying to kill the individual, that was the policy which was being adopted and it was most effective.

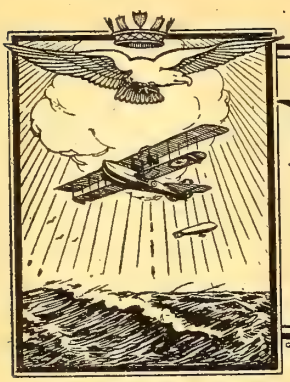
AIR BOARD NOTICE.

STANDARDISATION OF AERO-ENGINE RADIATORS.

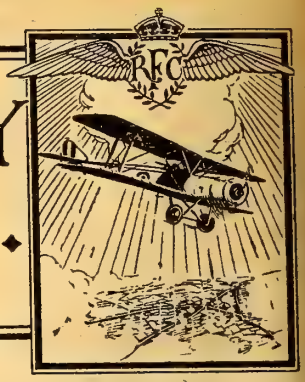
In the recently published annual report of the Advisory Committee for Aeronautics it was stated that the investigations on the subject of aeroplane radiators had been brought to a conclusion, and recommendations made for standardisation.

Effect has now been given to these conclusions by the Air Board, and a confidential circular letter has been issued to aeroplane contractors and radiator makers, instructing them as to the material which is to be used for this purpose in future designs.

Enquiries on the subject may be addressed to the Department of Aeronautical Supplies, Room 609, Air Board Office, Strand, W.C.2.



NAVAL and MILITARY AERONAUTICS



FROM THE "LONDON GAZETTE."

War Office, Sept. 4th.

REGULAR FORCES.—Memorandum.—Bt. Lt.-Col. (temp. Brig.-Gen.) J. M. Salmond, C.M.G., D.S.O., R. Lanc. R., to be temp. Maj.-Gen., June 22nd (substituted for the notification in the "Gazette" of July 28th).

War Office, Sept. 5th.

REGULAR FORCES—Establishments—R.F.C.—Mil Wing.—Wing Comdr.—Lt. (temp. Maj). R. A. Cooper, D.S.O., Yeo., T.F., from a Sqdn. Comdr., and to be temp. Lt.-Col. while so. empld., Aug. 17th.

Schools of Instn.—Schools of Aerial Gunnery.—The following appts. are made :—

Comdt.—Graded as a Wing Comdr.—Temp. Maj. A. R. C. Cooper, Gen. List, from a Chief Instr. (graded as a Sqdn. Comdr.), and to be temp. Lt.-Col. while so empld., Aug. 6th.

Chief Instr.—Graded as a Park Comdr.—Temp. Capt. H. Cockerell, Gen. List, from an Instr. (graded as an Equipment Officer, 1st Cl.), and to be temp. Maj. while so empld., Aug. 16th.

War Office, Sept. 6th.

REGULAR FORCES.—The following N.C.O.'s and Men to be temp. Sec. Lts. :—R.F.C.—Mil. Wing.—1st Cl. Air Mech. H. M. Haines, May 17th. 2nd Cl. Air Mech. R. A. Davey; 2nd Cl. Air Mech. L. G. Candy, from S. Afr. R.F.C., June 22nd. 1st Cl. Air Mech. L. Hawkins, June 23rd. Flt. Sgt. F. Little, June 26th. 1st Cl. Air Mech. C. F. Cotton, June 27th.

Establishments.—R.F.C.—Mil. Wing.—Flt. Comdrs.—From Flying Officers.—Capt. G. A. R. Spain, Ind. Army, July 1st. Temp. Capts. whilst so empld. :—Temp. Lt. K. S. Henderson, Gen. List, July 10th. Lt. D. Cloete, M.C., Spec. Res., July 20th. Capt. W. E. Birch, S. Lan. R., T.F., Aug. 8th. Sec. Lt. (temp. Lt.) W. A. Shirlaw, High. L.I., T.F., and to be temp. Capt. whilst so empld., Aug. 13th. Capt. H. S. Lees-Smith, Spec. Res.; Sec. Lt. C. C. Clark, R.A., and to be temp. Capt. whilst so empld., Aug. 21st; Sec. Lt. (temp. Lt.) W. V. T. Rooper, Yeo., T.F., and to be temp. Capt. whilst so empld., Aug. 24th.

Park Comdr.—Capt. H. B. T. Childs, Spec. Res., from an Equipment Officer, 1st Cl., and to be temp. Maj. whilst so empld., Aug. 25th.

Special Appt.—(Graded as an Equipment Officer, 1st Cl.).—Lt. R. H. C. Usher, M.C., Wilts R., Spec. Res., from a Flying Officer, and to be temp. Capt. whilst so empld., Aug. 22nd.

Schools of Instn.—Schools of Aerial Gunnery.—Chief Instr.—(Graded as a Sqdn. Comdr.).—Temp. Capt. G. Dixon-Spain, M.C., Gen. List, from an Asst. Instr. in Gunnery (graded as an Equipment Officer, 2nd Cl.), and to be temp. Maj. whilst so empld., Aug 20th.

War Office, Sept 7th.

REGULAR FORCES—Establishments—R.F.C.—Mil Wing.—Wing Comdr.—Capt. (temp. Maj.) R. R. Smith-Barry, Spec. Res., from a Sqdn. Comdr., and to be temp. Lt.-Col. whilst so empld., Aug. 23rd.

Special Appt.—(Graded as an Equipment Officer, 1st Cl.).—Capt. C. W. von Roemer, R.F.A., Spec. Res., July 16th.

Schools of Instn.—Officers' Technical Training Corps.—Comdt.—Temp. Capt. F. A. Forde, Gen. List, from an Asst. Comdt., Staff Officer, 2nd Cl. (graded as a Brig-Maj.), and to be temp. Lt.-Col. whilst so empld., July 19th.

War Office, Sept. 10th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing.—Flt. Comdrs.—Temp. Lt. F. A. Moodie, Gen. List, from a Flying Officer, and to be temp. Capt. whilst so empld., Feb. 17th, but without the pay and allowances of that rank prior to Aug. 27th. Capt. N. H. Bottomley, E. York R., Spec. Res., from a Flying Officer, Aug. 1st.

Flt. Comdrs.—From Flying Officers.—Capt. E. D. Drew, R.W. Surr. R.; Capt. W. A. Skeate, W. York. R., Aug. 27th. And to be temp. Capts. whilst so empld. :—Temp. Lt. P. G. Marr, Gen. List; Lt. P. B. Tabernacle, Can. Local Forces; Lt. H. H. Watkins, R.F.A., Spec. Res.; temp. Lt. V. G. A. Bush, Gen. List; Lt. R. W. A. de H. Haig, R.G.A., T.F.; Sec. Lt. (temp. Lt.) M. H. Turner, Dorset R., Spec. Res.; Sec. Lt. (temp. Lt.) G. H. Lewis, North'n R., T.F.; temp. Lt. J. Kerr, Gen. List; Sec. Lt. (temp. Lt.) A. H. Whistler, Dorset R.; Sec. Lt. (temp. Lt.) D. G. A. Allen, Durh. L.I., Spec. Res.; temp. Lt. V. H. Baker, M.C., Gen. List; Sec. Lt. G. A. Giles, Spec. Res.; temp. Lt. A. Morrison, Gen. List; temp. Sec. Lt. D. M. Faure, Gen. List; temp. Sec. Lt. I. E. M. Mackenzie, Gen. List.

Special Appt.—(Graded as a Park Comdr.).—Capt. C. A. J. Butter, Yeo., T.F., and to be temp. Maj. whilst so empld., Aug. 21st.

Gen. List.—To be Sec. Lt. :—Actg. Sgt.-Maj. J. C. Shakeshaft, from R.F.C., July 31st.

FROM THE COURT CIRCULAR.

Windsor Castle, Sept. 5th.

The following had the honour of being received by His Majesty, when the King conferred upon them the Military Cross.

Capt. Henry Meintjes, Gen. List and R.F.C.
Lieut. Francis Cave, Rifle Brigade and R.F.C.
Lieut. Mayes Fry, Gen. List and R.F.C.
Sec. Lieut. Reginald Malcolm, Gen. List and R.F.C.
Sec. Lt. George Wells, R.F.C.
Sec. Lieut. Arthur Wray, The Buffs, attd. R.F.C.

NAVAL.

The following appointments have been made in the Royal Naval Air Service :—

Sept. 7th.—Messrs. R. A. Coote and H. Bailey, both granted temp. commns. as Lt. (R.N.V.R.), seny. respectively, Aug. 31st and Sept. 6th.

Sept. 8th.—Temp. commd. as Lt. (R.N.V.R.) have been granted to the following, seny. Sept. 7th :—F. D. Taylor, A. M. W. Wells, J. O. W. G. Chambers, and L. F. Lambert.

Sept. 10th.—Mr. W. M. Johnson granted a temp commn. as Lt. R.N.V.R., with seny. of Sept. 8th.

Admiralty Communiqués.

Sept. 4th.—A bombing raid by naval aircraft was carried out at midnight on 2nd inst. on docks, submarine shelters, and railway sidings at Bruges.

Bombs were observed to explode over objectives, and a fire was caused adjacent to the lock gates of the Ecluse Canal.

A raid was also made in the early morning of 3rd inst. on Varssenaere aerodrome (south-west of Bruges); bombs were seen to explode amongst the sheds. One of our machines was attacked by six hostile aircraft, and succeeded in shooting down one completely out of control.

In an engagement which took place between one of our aircraft patrols and enemy machines there were three decisive combats.

One of our machines failed to return.

Sept. 5th.—At midnight on the 3rd inst., a bombing raid was carried out by Naval aircraft on the following military objectives :—

Bruges Docks.
Varssenaere Aerodrome (south-west of Bruges).
Ghistelles Aerodrome (south-east of Ostend).

Many tons of bombs were dropped with good results.

A second raid on Bruges docks was made at noon on Sept. 4th. Direct hits were observed on special targets. Many sheds along the quay side were also hit and large fires were caused, which could still be seen burning when machines recrossed the lines.

All machines returned safely from both raids.

During Monday afternoon (3rd inst.) an enemy aircraft spotting machine was engaged by one of our fighter patrols, and shot down completely out of control.

An enemy kite balloon was also attacked and the observer forced to jump out. Owing to anti-aircraft fire the fate of the kite balloon could not be observed.

A report has been received stating that an attack was carried out against Adrianople on the night of Sept. 2nd-3rd by machines of the Royal Naval Air Service.

Bombs were dropped on the railway station and bridge (over the Maritza) with good effect.

THE CASUALTY LIST.

Reported Sept. 5th.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Saunders, Flt. Sub-Lt. R. G., R.N.
Pegler, Flt. Sub-Lt. C. R., R.N.

Reported Sept. 6th.

ACCIDENTALLY KILLED.—Thomas, Flt. Sub-Lt. J. E., R.N.
PREVIOUSLY REPORTED MISSING, NOW OFFICIALLY REPORTED PRISONERS.—Brady, Flt. Sub-Lt. B. J. W., R.N.
Marsh, Obsr. Sub-Lt. L., R.N.
DIED OF WOUNDS.—Whitehouse, H. A., Aircraftsman, 1st Cl., F.19467.

Reported Sept. 7th.

MISSING.—Hall, Flt. Sub-Lt. N. D., R.N.
Scott, Flt. Sub-Lt. G. B. G., R.N.
WOUNDED.—Howard, Flt. Sub-Lt. G. E. C., R.N.

Reported Sept. 8th.

ACCIDENTALLY KILLED.—Coombe, Flt. Officer A. S., R.N.
ACCIDENTALLY DROWNED.—Varden, Flt. Sub-Lt. M. S., R.N.
ACCIDENTALLY INJURED.—Saunders, Flt. Sub-Lt. C., R.N.
Elliot, Obsr. Sub-Lt. G. H., R.N.

Reported Sept. 10th.

MISSING.—Foster, Flt. Sub-Lt. W. E., R.N.
Burns, Obsr. Sub-Lt. H., R.N.
SEVERELY WOUNDED.—McCrudden, Flt. Sub-Lt. S. H., R.N.

Reported Sept. 11th.

DIED OF INJURIES.—Dawson, Prob. Flt. Officer J. M., R.N.

PERSONAL NOTICES.

Deaths.

COOMBE.—Flt. Lt. Coombe was killed on Sept. 7th at Chingford, when his machine fell into the reservoir. The passenger, Proby. Flt. Officer Saunders, who was badly injured, was taken to the Edmonton Military Hospital.

DAWSON.—The death has occurred in an hospital on the North-East Coast of Prob. Flt. Officer John Marshall Dawson, R.N., aged twenty-one, as the result of injuries sustained through a fall whilst flying on Sept. 7th. His home was at Sixshell Bank, Ripon.

THOMAS.—The inquest on Flt. Sub-Lt. J. E. Thomas, R.N., aged 23, whose death in a flying accident near Yeovil on Sept. 3rd was announced last week, was held on Sept. 5th. Sqdn. Comdr. Evill, D.S.C., R.N., said that in his opinion the accident was due to the pilot's over-confidence in the machine. He had been used to handling more powerful machines, which would stand more trick flying than the one he was using. The accident was caused by a little lack of caution while at too low an altitude. An engine mechanic stated that there was some trouble in starting the engine, but the engine was running all right when Mr. Thomas went away. The witness said he had never run one of these engines before. He did not like the engine. The jury returned a verdict of "Accidental death," adding a rider that officers should not be called upon to fly machines the engines of which they did not know.

VARDEN.—Flt. Sub-Lt. Medwin Seymour Varden, who was drowned on Sept. 4th as the result of a flying accident, was the second son of Mr. and Mrs. Varden, Highview, Seaford. He was 20 years of age, and had a seniority of December, 1916.

Marriages.

ATKINSON—BILLEN.—On Aug. 18th, at the Mairie of the 12th Arrondissement, Paris, Lt. J. Clifford Atkinson, R.N.A.S., only son of Mr. J. E. Atkinson, of Reading, was married to Mdlle. Marcelle Billen, lately nursing on the Western Front, daughter of M. Ludovic Billen, of Lens, Yonne, France, art critic. critic.

JONES—ASTLEY ROBERTS.—On Sept. 5th, at St. Saviour's Church, Eastbourne, Sqdn. Comdr. Robert Hilton Jones, R.N., only son of Mr. and Mrs. Robert Jones, formerly of Barmouth, Wales, was married to Eileen Ruby Astley, only daughter of Col. Astley Roberts, R.F.A., and Mrs. Astley Roberts, of Badlesmere, Eastbourne, by the Vicar, the Rev. H. Urling Whelpton, assisted by the Rev. C. W. Horsburgh.

SHOPPEE—GIFFORD-TAIT.—On Wednesday, Sept. 5th, at All Saints, East Cowton, Northallerton, between Flt. Lt. Lionel Conrad Shoppee, D.S.C., R.N., son of Eustace Cyril Shoppee, Esq., of Cape Town, S. Africa, was married to Hilda Gifford-Tait, daughter of the late Capt. Tait, R.N.R., and Mrs. Tait, Cardiff, and niece of the Rev. R. Gifford-Wood, M.A., B.A., Vicar of East Cowton.

The ceremony was performed by the Lord Bishop of Knaresborough, assisted by the uncle of the bride. The bride was given away by Gen. Sir Herbert Chernside, G.C.M.G., late Governor of Queensland. A reception was held at the Vicarage and afterwards Lieut. and Mrs. Shoppee left by motor to spend the honeymoon at the English Lakes.

WATT—REID.—On Sept. 3rd, at St. James's, Edmonton, Flt. Sub-Lt. Norman Charles Watt, R.N., elder son of Capt. I. Watt, Adjt., National Guard, formerly of H.M. Coldstream Guards, and Mrs. Watt, of Sneath Avenue, Golders Green, was married to Dorothy Sherwood, only daughter of A. W. Sherwood Reid and the late Mrs. Reid, of Edmonton, Middlesex, by the Rev. A. E. Brooks, A.K.C.

Births.

DONALD.—On Sept. 3rd, to Gwynneth Adrienne, wife of Flt. Lt. D. Grahame Donald, R.N.—a son.

TOMKINSON.—On Sept. 8th, at Bentley, Suffolk, the wife of Squad. Comdr. Lancelot Tomkinson, R.N., of a daughter.

The wanderings of an observation balloon attracted considerable attention on Sept. 4th. It broke adrift from its moorings at Barnes and passed over Acton, where there was great excitement when an aeroplane appeared and circled round it.

It came to earth eventually at Piters Farm, near Rickmansworth, at 8.10 p.m., when it was discovered that the balloon was in charge of an officer of the R.N.A.S., who landed unhurt.

[The last sentence has a pleasing ambiguity. To be "in charge of" may be taken either way.—Ed.]

MILITARY.

G.H.Q. Communiqués.

SEPT. 4th, 9.0 p.m.—There has been some bombing by the enemy of various places behind our lines during the last two nights. At some of the points attacked a few casualties occurred amongst soldiers and civilians, and some damage was done to private property. No damage of military importance was caused. Last night one of the enemy's machines employed on these operations was brought down by our fire.

The improvement in the weather led to great activity in the air yesterday on both sides. Much successful work was done in co-operation with our artillery, and many photographs were taken. In the course of the day and night over five tons of bombs were dropped by our aeroplanes on the enemy's railway stations, billets and aerodromes.

Enemy aircraft were aggressive in air fighting. Twelve German machines were brought down, and five others were driven down out of control.

Seven of our aeroplanes are missing.

SEPT. 5th, 9.4 p.m.—Artillery activity continues on both sides on the Ypres battle front.

Last night enemy aeroplanes again dropped bombs at different places behind our lines. A few casualties were caused in one of our hospital areas and some damage has been done to civilian property. There was no damage of military importance. One of the enemy's raiding machines was brought down by our fire and destroyed.

Our aeroplanes have continued bombing operations actively by day and night.

Yesterday great activity in the air prevailed on both sides. Our artillery, machines, and balloons worked all day in co-operation with our artillery in spite of vigorous attacks from hostile aeroplanes.

A record number of aerial photographs were taken by us, many of them at great distances behind the enemy's lines.

Though the enemy's aeroplanes showed themselves disinclined to meet our fighting machines unless well east of the line, five hostile machines were brought down in combat and nine others driven down out of control.

Seven of our machines are missing.

SEPT. 7th, 10.7 a.m.—Further information shows that on the night of the 4th-5th inst. German aircraft dropped bombs on three hospitals.

11.56 a.m.—The following details are now available concerning the bombing operations carried out by our aeroplanes on the 4th inst. :—During the day 24 bombs were dropped on enemy's billets at Hantay, east of Lens, and 30 on billets at Lauwin-Planque in the same area. Five bombs were dropped on Audenarde railway junction (over 30 miles east of Ypres), and seven on Aubigny-au-Bac ammunition dump (seven miles north-north-west of Cambrai) and station of Cambrai. Eight bombs were dropped on Carnières aerodrome, east of Cambrai, and 61 on various other targets.

During the night of the 4th-5th bombs were dropped from an average height of 1,000 ft. as follows :—

Four on a large aerial training school near Valenciennes;

Twelve on Ramegnies Chin aerodrome, near Tournai;

Twelve on Somain (east of Douai) railway junction sidings two of which fell directly on the sidings;

(*Continued on page 761*).

AERONAUTICAL ENGINEERING

SUPPLEMENT TO "THE AEROPLANE"

INCORPORATING AIRCRAFT ENGINEERING, AERODYNAMICS, AND MATTERS PERTAINING TO THE AERONAUTICAL ENGINEER AND THE AIRCRAFT TRADER

The British Aircraft Industry.

BY CHARLES L. FREESTON.

XXVI.—THE WESTLAND AIRCRAFT WORKS.

Seldom nowadays does one meet with any reminiscence of a period earlier than 1896, so far as the evolution of the internal combustion motor is concerned. But Mr. E. W. Petter, the Chairman of Petters, Limited, and of the Westland Aircraft Works, Yeovil, and member of the Committee of Management of the S.B.A.C., can tell a poignant little story which carries one farther back than the year of the famous "Emancipation Act."

Early Enterprises.

In 1895, to be exact, he and his twin brother, Mr. P. W. Petter, designed one of the first motor-cars ever built in this country, with a view to taking part in the "Engineer" competition for vehicles with paraffin-driven internal combustion motors.

When the time for adjudication arrived, the brothers turned up proudly enough with their car, and found that it was the sole competitor. In the circumstances, a walk-over for the £1,000 prize seemed assured, but their hopes were dashed to the ground when the judges announced that there would be no award, in consonance with a clause in the conditions by which it was provided that the prize might be withheld in the event of no vehicle of sufficient merit being forthcoming.

A Happy Inspiration.

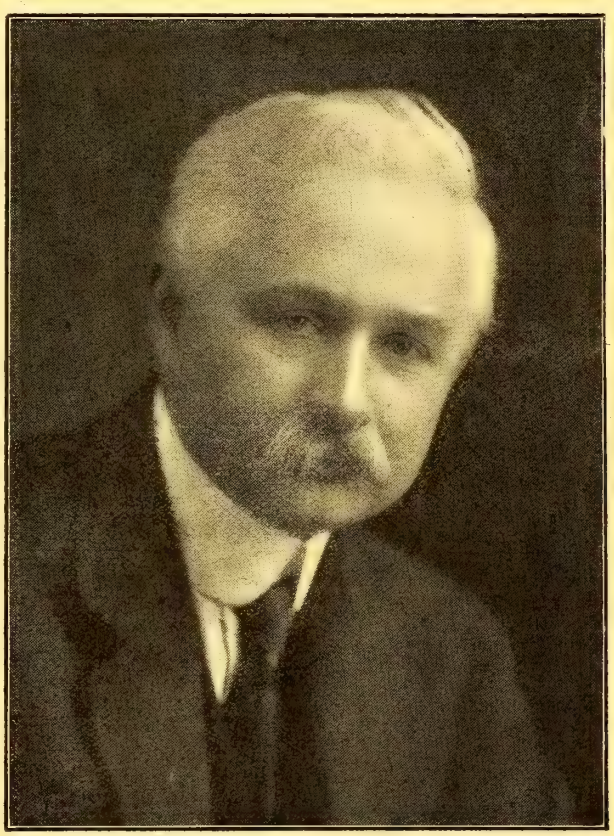
Sorrowfully, the brothers hied themselves homewards with their ill-fated car, and arrived in Yeovil two ruined men. They had spent all their capital on the production of the car, and, in the face of their non-success in the contest on which they had pinned their hopes, had nothing in hand for immediate needs, and nothing to look forward to for the future.

Then one of them was seized with a happy inspiration. "Let us take the engine out," he said, "and turn it into an agricultural oil engine." This was forthwith done, and, as Mr. E. W. Petter remarked to me the other day, "Since then, we have used no other." The phrase must be interpreted to mean that with this little 3-h.p. single-cylinder horizontal motor was laid the foundation of a business which, from 1896 to 1915, was exclusively confined to the production of agricultural and marine motors, and grew into very large dimensions, some 15,000 engines having been produced during that period at the Yeovil works, in sizes ranging up to 300-h.p.

A New Site.

In the year 1913 a new site of 50 acres was acquired, to which it was intended to transfer the engineering works *in toto*, but before this plan could be completed the war broke out, and eventually quite altered the aspect of affairs. The original works remain, with an extension in the shape of one of the finest foundries in the West country, but the major portion of the new site has been devoted to the production of aircraft. Meanwhile, the Petter oil engine is in greater demand than ever, and bears out the motto of the firm, which is thus practically expressed:—

"Cheapness in the Petter sense,
Is cheapness born of excellence."



Mr. E. W. Petter.

The Aircraft Business.

It was in the memorable month of April, 1915, however, when Mr. Lloyd George put forth his appeal to the manufacturing classes to come to the country's aid, that the board of Petters, Limited, met to consider the situation, and adopted a resolution by which they pledged themselves to place the entire resources of their works at the service of the Government. Letters were accordingly dispatched to the War Office and Admiralty respectively, inviting a statement as to the form of help which the firm might render.

From the former no answer was vouchsafed, but the Admiralty wrote to ask if Petters, Limited, would undertake the manufacture of aircraft, and added that it was a comparatively simple thing, involving no previous knowledge, and that designs would be supplied, which could be carried out by workers in wood and metal. The firm assented to the proposal, and were then asked to go round one or two aircraft factories in order to familiarise themselves with the processes involved. Visits were paid accordingly to the works of Short Brothers, Armstrong-Whitworth's, and one or two others.

An Invaluable Coadjutor.

By this time it had become patent that aircraft production was not quite so simple a matter as it had appeared at first sight, and the brothers Petter decided to get into touch with someone who possessed a more intimate acquaintance with the practical requirements of the case than themselves. Very fortunately they secured the services of Mr. R. A. Bruce, under whose able guidance most excellent results have been attained.

The Westland Aircraft Works was formed as a separate and subsidiary company, with Mr. E. W. Petter as Chairman, and Mr. Bruce as Director, and the building of Short seaplanes,

under Admiralty contract, was begun as soon as possible. Mr. Bruce, it may be pointed out, was no new hand at the game. He had already had experience of aeroplane construction while engineering manager to the British and Colonial Aeroplane Co., Ltd., of Filton, from 1912 to 1914, and had been actively interested in aviation at a much earlier date; Lieut. Dunne, in fact, while experimenting at Eastchurch, was very anxious that Mr. Bruce should become his manager. Incidentally, it may be mentioned that Mr. Bruce was associated with Mr. Louis Brennan in his monorail experiments, and carried out all the engineering work in connection with that interesting undertaking.

How Naval Inspection Originated.

When the war broke out, Mr. Bruce was acting in a consultant capacity for the Greek Government in respect of an order for Sopwith aeroplanes, and while at the Kingston works he was asked by the Admiralty to become one of the first inspectors of aeroplane production. At that time they had no power of appointment to any such office, but suggested that Mr. Bruce should join the R.N.V.R., and offered him a commission therein, which he accepted. He was then put onto inspection work, as also was Lieut. Stronach, and these two officers really formed the nucleus of what is now, of course, an enormous department.

When Lieut. Bruce, as he then was, received the invitation from Petters, Limited, to join them as director of an aircraft department, he laid the matter before the Admiralty, who considered that he would do good service by aiding production of seaplanes at Yeovil.

Rapid Extensions.

At that time the only building actually erected on the new site was one which was intended to serve the purpose of a machine shop. The original works of Petters, Limited, was situated about 1½ miles away. The Admiralty sent down an inspector to view the new building, and decided that it would be very suitable for the purpose of aircraft production, and by the time Mr. Bruce entered upon his new duties the first contract for seaplanes had just been received.

Mr. Bruce realised that it would be impossible to deal with this adequately without considerable extensions, and these were put in hand forthwith. Suitable plant was obtained in the shape of wood-working and metal-working machinery, and in August, 1915, serious constructional work was begun.

The staff only consisted at that time of Mr. Bruce and Mr. Warren, an architect of Yeovil, who had previously been associated with Petters, Limited, and proved of great assistance in the development of the new venture, both by the display of good business qualities and in connection with the laying out of additional buildings.

Mr. R. A. Bruce.

The First Seaplane.

Meanwhile the main works of the firm had become exceedingly busy with War Office contracts and could spare no men, so that in addition to the erection and equipment of new buildings, Mr. Bruce and Warren had to attract men from outside, and these, of course, had to be trained to the work.

The first seaplane was completed at the beginning of 1916, and from that time the new Westland Aircraft Works began to deliver 225-h.p. Sunbeam-Shorts. A further contract was received for 200-h.p. Canton-Unné machines, and this was followed by an order for Sopwiths, with Clerget engines.

Of more recent orders it is impermissible to speak, as also of an experimental machine of the Westland firm's own design; suffice it to say that the output is increasing and the works have been and are still being extended. They are most conveniently situated, for on one side is the firm's own aerodrome of 61 acres, while on another is a railway siding to which completed goods can be transferred straight from the factory floor.

High-class Machines.

A tour of the works leaves no room for doubt as to the systematic thoroughness of the methods employed in every department alike. The appearance of the completed machines is particularly pleasing, and it is not surprising to learn that the behaviour of the Westland products at the front has received high official recognition, of which I was afforded documentary evidence.

Delays Avoided.

One noteworthy feature of the Westland *ménage* is that nothing is allowed to interfere with continuity of output so long as delay can be humanly avoided. If needed parts are not forthcoming to promise, the firm set to and make them on the premises, and pride themselves on being able to produce anything in the way of spare parts when wanted. As Mr. Bruce remarks, this may not be the most economical way of running a business, but few will deny that it is a sound policy in a time of national stress.

Sound Advice.

The testing methods employed are exceptionally conscientious, while even from the very outset the fact is impressed upon the employees that they are dealing with a class of work in which minute attention to detail is of the highest degree of importance. Indeed, every workman who signs on is handed a printed exposition of wise counsel on the necessity of avoiding bad work, and the terms of this interesting statement may be reproduced herewith:—

"All workmen are warned of the serious consequences of bad work in the construction of aircraft.

"The failure of a comparatively small or apparently insignificant detail may imperil the safety of the whole machine of which it is a component, because in aircraft success is only gained by reducing the weight of every part to the bare minimum for strength, and consequently the whole structure is composed of delicate parts which are easily injured, and the detection of a damaged part is often difficult or impossible except by the workmen who make or assemble the parts.

"All workmen are therefore earnestly asked to point out any defects which they may observe, whether the defect noticed occurs from accidental damage or from errors of workmanship.

"It is pointed out that all reasonable allowance will be made to men who make mistakes, so long as they honestly point them out to their foreman, charge-hands, or managers. Any man who fails to report any defect which comes to his notice may contribute to the maiming or the death of two fellow men.

"Whilst the greatest measure of leniency will be extended to those who accidentally damage work, any man who is detected in attempting to conceal or patch bad work, whether it is his own or another's, will be instantly dismissed. Faults in material must be at once reported, and charge-hands are cautioned that they must be vigilant in detecting them.

"A few examples are given where special caution is needed. The nuts and bolts used in aircraft construction must be tightened with great care, and everyone is warned not to strain them by overtightening. If a bolt is damaged by overtightening of the nut it must at once be removed and the matter reported. In bending metal fittings it is always necessary to look out for flaws or cracks at the edges of the metal, and if such are found the matter must be reported. Shakes or other defects in timber must be carefully watched for and their presence, if detected, pointed out.

"In conclusion it should be recognised that in helping to construct a seaplane each workman is furnishing the country with a formidable weapon, and that whilst by doing his best to work quickly he is helping his country, if any faults due to bad or careless work are allowed to pass undetected, the result of his own work and that of his fellow workmen will be rendered useless or positively dangerous.—R. A. Bruce, Manager."

It only remains to be added that Mr. Bruce is surrounded by a loyal and efficient staff, among whom may be particularly mentioned Mr. Norton, indefatigable in the discharge of his heavy responsibilities as commercial manager, and Mr. Davenport, the chief designer.

On Millimetres and other things Metric.

BY V. P. BENEDICT.

Metric measures have, with the advent and meteoric growth of affairs aeronautical, become of very primary importance to all of us who are concerned or connected with the industry or the Service. For reasons varied, and chiefly because we have in the past been compelled to grant priority in pioneering work to our Allies across the Channel, we now find ourselves forced to labour and to think to a great extent in terms decimal. Similarly, and previously, our importation of the products of French motor-car factories familiarised many of us with their standards of measures.

The metric system was not unknown in this country in those far back times now yclept "pre-war," in fact, the question as to whether we shall or shall not adopt the system as our own legal standard has been under discussion, in true British fashion, for the past half-century. It was before the "talk-shop" as far back as the 'sixties, and has been revived at various intervals since. A Bill was actually proposed in 1907, but failed to pass into law.

Now, while confessing to strong leanings in favour of the universal adoption of the metric system, mine is not the pen nor this the time and place to enter fully into the pros and cons thereof, nor to attempt to enumerate the thousand and one points for and against, for hereby hangs a controversy of 50 years' standing, but one which, in the writer's opinion, will come due for settlement as one of the problems affecting our commercial standing "apres la guerre."

It is, however, worth mentioning, "en passant," that already some 35 or 36 countries have adopted the system, while only three, worth mentioning, have not, viz., England, U.S.A., and Russia. In justice let it be said that on population, taking the British Empire in with England—and Russia likewise—the noes have it by 560 millions, against the ayes 450 millions. At the same time, there is little doubt that since we are such good customers of Uncle Sam, if we were to adopt the system he would not be long in lining up. Trust him. He has already his decimal coinage, to wit, the "almighty dollar" and the "red cent."

Australia, some years back, passed an Act adopting the metric system, but this only becomes operative when England also adopts it. It may almost be taken for granted that when we do so, and many well-informed people consider it inevitable, the rest of the non-metric countries will very soon follow suit, which will give us a universal system of weights and measures and all that such implies.

However, suffice it for the scope of these lines to serve as a skeleton résumé of the origin, the main points in favour, and the application of the metric system to things aeronautical.

The system as a whole, from its very simplicity, is justified in claiming an iota of our time in a brief general review of its ingenuity, and the method by which measures of distance, volumetric capacity and weight are correlated the one to the other.

As we know it to-day, that is, as the French legal standard of weights and measures, the metric system is not the complete scheme as originally proposed. Devised in the troublous years of the Revolution, the intention was to wipe out the divisions of time which belonged to the Christian Era, and to alter the immemorial standard of 360 degrees as the division of the circle.

There were to be 400 degrees of 100 minutes each by which to divide the world's circumference, and 360 days to the year, with 10 hours of 100 minutes to the day, and it was here that the scheme "bust up." The year declined the official request to drop its odd five days, and the French people declined with thanks the ten-hour day, although the authorities tried to enforce it by all sorts of penalties.

Having succeeded in retaining the staid old 24-hour division, the 400 degree circle went by the board because it became unworkable, since mariners found themselves with a combination of 24 hours and 400 degrees which, divided, yields a one-eyed fraction. So they reverted to the 360 degree division, which gives four minutes of time to one degree of the earth's rotation, or 15 degrees of rotation for each hour.

Now although these unworkable portions of the scheme were dropped, the remaining standards, which were based on the 400 degree circle, were retained and adopted. Four hundred degrees of 100 minutes gives 40,000 minutes, and one-thousandth of a minute was taken as the standard for a unit measure and was called a metre. Although, as a matter of fact, not strictly accurate, the metre was meant to be one forty-millionth part of the world's circumference.

To get a unit for volumetric capacity, one-tenth of a metre (about 4 in., English measure) was taken and cubed to give the litre, and taking a litre of pure water at (O) degrees temperature centigrade, the weight of it was obtained and divided into one thousand parts to give the standard unit of weight, which was called a gramme.

Incidentally and apropos of little, our American cousins (?) call the gramme, gram; the metre, meter; and the litre, liter; but this method of spelling is peculiarly their own and does not so figure in the R.A.F. specifications or any others. Still, best be warned in case the standard aero-'bus of the future is the "Ford" of forty meters span, with an engine of 12,000 cubic centimeters capacity (which in some products does not necessarily mean h.p.), and able to carry 10,000 kilograms of dead (very dead) weight (subject to losses en route). Note the catalogue figure is not yet fixed, as Henry is undecided whether to knock two cents off the price and thereby lose a thousand dollars a day of his profits.

However—to our muttons—the three units, the metre, the litre and the gramme, are each uniformly divided and multiplied by tens, wherein lies all the simplicity of which adherents to the system so justifiably boast. To learn the whole system one has to memorise only about six prefixes beyond the three units, or nine items in all, and in commercial use only about half of these are called into service.

Below is given the French boy's equivalent of our own antiquated conglomeration called Tables of Weights and Measures, and on top of the quality of brevity remember that when they learn the tables they have an idea from the learning of the metre and its divisions how much is represented by the litre and by the kilogramme.

When the English schoolboy gets his 12 inches to the foot, three feet one yard business visualised, he is still in the dark when told that eight pints make one gallon, until he is shown the size of a pint or gallon measure, and so with his weights.

TABLE OF METRIC WEIGHTS AND MEASURES.

1/10000th	1/100th	1/10th	UNIT.	10.	100.	1,000.
Prefix to Unit.				Prefix to Unit.		
Length. Volume. Weight	Milli....	Centi....	Deci....	METRE. LITRE. GRAMME.	...Deca....	Hecto.....	Kilo.....

Here is a unit of length, one of volume, and one of weight, all correlated and each divided and multiplied uniformly, all of which, since the medium of correlation is pure water at a given temperature, can be corrected in any part of the world. In conjunction with a decimal coinage, in which each division is by tenths, calculations, which in English terms are most intricate, become of much simpler character.

Now the ratio of specific gravity for any substance is taken on the basis of water at (O) degrees centigrade as the unit, and since the kilogramme is the weight of a cubic decimetre of water, it is simply necessary to multiply the cubical contents of a given object in decimetres by the figure of specific gravity to obtain the weight in kilogrammes. Obviously, a saving over the English method where it is necessary to first find the weight of a cubic foot of water as an essential factor in the calculation, and then multiply this by the figure for specific gravity and then by the cubical contents in feet.

The metric system owes its simplicity mainly to the decimal basis on which all its sub-divisions are formed. Thus, if you have 752 millimetres you have also 0.752 metres, and 752 metres equals 0.752 kilometres. With English measures, 752 in. is 62 ft. 8 in., or 20 yds. 2 ft. 8 in., and since our rules are in feet or yards, if you want to measure 752 in. you have first to do a bit of arithmetic.

Similarly if a French aeroplane contains 801 nuts of 22.0 grammes each, the total weight (of nuts, not the plane) would be 17,622.0 grammes. Shift the decimal point three to the left (equal to dividing by 1,000) and you get 17.622 kilogrammes, and 100 planes would contain similar nuts to the weight of 1762.2 kilos., obtained by simply shifting the point.

Try it in English: 801 nuts of 1 oz. each equals 801 ozs., or 50 lbs. 1 oz., and you would need to work it out before you could weigh this amount. One hundred times the amount is 5,006 lbs. 4 ozs. weighed as 2 tons 4 cwt. 2 qrs. 22 lbs. 4 ozs. (If the weight happens to be 1¼ ozs. the job is twice as bad).

And if they were bought by weight—the French at 7 francs per kilogramme—theirs would cost 123.354 francs each plane for the nuts, or 12335.4 for the 100 sets.

At 3s. per lb. ours would work out at 150s. 2½d. per set, to be paid for as £7 10s. 2½d., and for 100—well, 100 times this amount. Work it out yourself, I've lost my slide rule.

Which ought to be enough to show how much more simple are calculations metric than English.

And how many Englishmen (or Britons, if you like the wider term) know their weights and measures thoroughly off by heart. Not ten in the whole country. Every trade has its own weights and all of different values, and so conglomerated that they mostly rely on printed tables rather than head-work.

The pound weight was originally the weight of one pint of wheat, and the stone was the weight of a peck. The stone and peck to-day mean different values in different trades, and the whole is a most unholy chaos, to appreciate which it is only necessary to study the market reports of various commodities in the daily papers, which leave one as ignorant of what they ought to convey, as do the official communiqués on aeroplane losses.

For we learn at school that 14 lbs. make one stone, but the butcher does it with 8, which is 6 to the good, and the ounce avoirdupois can be got with lots less grains than the ounce troy. And a peck of peas or a pint of periwinkles are what you get for your money, and not what the table of weights and measures says they are.

The whole of which has much to do with why the Continental youth is better taught than those of this country, and why he, generally speaking, is individually able to make better use of what he has been taught when he comes to commercial life.

Now whether we agree that the Metric System is preferable to our own, or, even if preferable, whether it is worth while going to the cost of changing (estimated at between 200 and 400 million pounds) the fact remains that many drawings of aero-parts and components, practically all those of Continental design and not a few of English, are dimensioned in metres and millimetres, so those of us to whom these represent part of the daily grind will need to know how to tackle the problem of working in millimetres or, in the alternative, how to convert those same into English inches and fractions thereof (decimal fractions necessarily).

There are certain leading factories in this country who make a point of working in French measures entirely (and this quite prior to their advent into the aero-industry), with the exception of odd items such as the holes for bolts, which they dimension in inches, because of suiting English made bolts and screws. Others change all metric figures into English when making their working prints or drawings, and, most extraordinary, but truly English, some firms do both, one method in one branch or department, and the opposite in another.

In still further cases the drawings are left dimensioned metric, and a conversion table is put out into the shops to enable the operatives to do their own converting—another truly English make-shift way of putting liability for error (and an increased liability at that) on the lesser dog. Uneconomical also because every dimension gets converted perhaps fifty times a month, whereas the drawing office could have done it once for all.

To handle metric-dimensioned parts satisfactorily, the best way undoubtedly is to have metric measuring instruments, get a grip of the metric system itself, which ought to take next to no time, and then go ahead metrically.

Instruments, however, are expensive and very difficult to obtain, so where these circumstances render the foregoing procedure unfeasible it becomes necessary to make conversions. For which purpose is printed in this issue a Metric to English Conversion Table, which has been specially compiled to meet the particular requirements of the aircraft industry.

For small accurate parts such as engine components care must be taken to make conversions to at least the fifth place of decimals of an inch. The reason why being that the tolerance allowed is sometimes 0.00025 in. where close fits are required, and unless the fourth and fifth decimal places are accurately taken it is possible to start with an error in excess of the given allowance. When working in metres on wings and fuselages two decimal places of an inch are more than sufficient.

This table is designed to be used for both metres (m.) and millimetres (mm.) since a "bus" is a big thing built up of a lot of little ones. The figures as they stand, with the point in the place shown, are for millimetres converted into inches. To convert metres into inches (which can readily be turned into feet, if necessary), the decimal point is to be taken as occurring three spaces later as shown by the slight gap between the figures.

To use the table for millimetres, the column headed .0 contains the English equivalent in inches of the even number of millimetres shown down the left side. These run from 1 to 40, and all tenths of a millimetre from 0.0 up to this figure are shown in the columns, progressing by one tenth at a time to the right. To convert a number of even mm. greater than 40, it is only necessary to adjust the decimal point as shown in the following examples.

For 6.0 mm. take the figure opposite 6 in col. headed 0.0 =0.23622 in.

6.7 mm. take the figure opposite 6 in col. headed 0.7 =0.26378 in.

67.0 mm. take this latter figure and, since 67.0 is 10 times greater than 6.7, move the point one right, which multiplies the result by 10 to agree. =2.6378 in.

278.0 mm. take figure opposite 27 in col. 0.8 and move point one to right. =10.9449 in.

2.78 mm. same figure, but point one to left (ten times less). =0.10944 in.

275.0 mm. take 2.75 mm. and move the decimal point two places to right since it is 100 times less than the figure required.
or take 27.5 mm. and move the point one place to right.

The examples show how wide the range of the table as it stands. Every likely conversion can be handled as in the higher figures, the small fractions are rare and unnecessary, and over 400 mm. anything more odd than 25's, 50's and 75's, which are covered by the table, are not likely to be met. It will frequently be found possible to get a double check on the conversion figure as in the case of the example given above of 275.0 mm., which can be taken either on 10 times the figure for 27.5 or 100 times the figure for 2.75.

For the conversion of metric measures, other than those of length, which are covered by the table, the subjoined schedule of conversion factors will be found of use, and will cover any need likely to arise. It is not always necessary to work to the full number of decimal places given, but the accuracy desired must govern the factor used.

Multiply	by	to convert to
Miles	1.6093	Kilometres.
Kilometres	.62138	Miles.
Square inches	6.4517	Square Centimetres.
Square Centimetres	.155	Square inches.
Square feet	.092903	Square Metres.
Square Metres	10.7639	Square feet.
Cubic inches	16 387	Cubic Centimetres.
Cubic Centimetres	.061025	Cubic inches.
Cubic feet	.028317	Cubic Metres.
Cubic Metres	35.314	Cubic feet.
Cubic feet	28.317	Litres.
Litres	.035315	Cubic feet.
Lbs.	.45359	Kilogrammes.
Kilogrammes	2.2046	Lbs.
Ounces (avoir)	28.348	Grammes
Grammes	.035275	Ounces.
Lbs. per Sq. inch	.070308	Kilogs per Sq. Centimetre.
Kilogs per Sq. Centimetre	14.223	Lbs. per Sq. inch.
Lbs. per Sq. foot	4.8825	Kilogs per Sq Metre.
Kilogs per Sq. Metre	.20481	Lbs. per Sq. foot.

FRACTIONS.				DECIMALS.			
mm.	inches.	mm.	inches.	mm.	inches.	mm.	inches.
1/16	.002461	9/16	.022145	.005	.000196	.05	.001968
1/8	.004921	5/8	.024606	.01	.000393	.06	.002362
3/16	.007382	11/16	.027067	.02	.000787	.07	.002755
5/16	.012303	13/16	.031988	.03	.001181	.08	.003149
3/8	.014764	7/8	.034448	.04	.001574	.09	.003543
7/16	.017224	15/16	.036909				

THE AMERICAN N.P.L. AND ITS WORK.

The national advisory committee for aeronautics has issued the following notice:

At a recent meeting of the sub-committee on power plants of the national advisory committee for aeronautics, preparations were made for the development at the Bureau of Standards of a laboratory for testing aircraft engines under conditions of altitude and temperature similar to those encountered in flights at an altitude of 20,000 feet or more. The laboratory and its experimental equipment will be organised under the auspices of the advisory committee, and the investigations will be directed by the sub-committee on power plants.

The special immediate purpose of this proposed equipment is the prompt testing out of the so-called "All American" aeroplane engine, now under development, in order to be able immediately to put it under controllable conditions corresponding to any altitude and any atmospheric condition which would be met in the air.

[An interesting scheme, but it must be remembered that widely differing results are obtained from an engine on the test-bench and in an aeroplane, and it is sincerely to be hoped that no attempt will be made to standardise the engine before it has been fully tried under actual flying conditions.—Ed.]

Metric Conversion Table. Metres and Millimetres into Inches,

BASIS FACTOR: 1 metre equals 39.370113 inches. *Adopted by Order in Council*, May, 1898.

Metres or millimetres	.0	.1	.2	.25	.3	.4	.5	.6	.7	.75	.8	.9
0	—	.003 94	.007 87	.009 84	.011 81	.015 75	.019 69	.023 62	.027 56	.029 53	.031 50	.035 43
1	.039 37	.043 31	.047 24	.049 21	.051 18	.055 12	.059 06	.062 99	.066 93	.068 90	.070 87	.074 80
2	.078 74	.082 68	.086 61	.088 58	.090 55	.094 49	.098 43	.102 36	.106 30	.108 27	.110 24	.114 17
3	.118 11	.122 05	.125 98	.127 95	.129 92	.133 86	.137 80	.141 73	.145 67	.147 64	.149 61	.153 54
4	.157 48	.161 42	.165 35	.167 32	.169 29	.173 23	.177 17	.181 10	.185 04	.187 01	.188 98	.192 91
5	.196 85	.200 79	.204 72	.206 69	.208 66	.212 60	.216 54	.220 47	.224 41	.226 38	.228 35	.232 28
6	.236 22	.240 16	.244 09	.246 06	.248 03	.251 97	.255 91	.259 84	.263 78	.265 75	.267 72	.271 65
7	.275 59	.279 53	.283 46	.285 43	.287 40	.291 34	.295 28	.299 21	.303 15	.305 12	.307 09	.311 02
8	.314 96	.318 90	.322 83	.324 80	.326 77	.330 71	.334 65	.338 58	.342 52	.344 49	.346 46	.350 39
9	.354 33	.358 27	.362 21	.364 17	.366 14	.370 08	.374 02	.377 95	.381 89	.383 86	.385 83	.389 76
10	.393 70	.397 64	.401 58	.403 54	.405 51	.409 45	.413 39	.417 32	.421 26	.423 23	.425 20	.429 13
11	.433 07	.437 01	.440 95	.442 91	.444 88	.448 82	.452 76	.456 69	.460 63	.462 60	.464 57	.468 50
12	.472 44	.476 38	.480 32	.482 28	.484 25	.488 19	.492 13	.496 06	.500 00	.501 96	.503 94	.507 87
13	.511 81	.515 75	.519 69	.521 65	.523 62	.527 56	.531 50	.535 43	.539 37	.541 34	.543 31	.547 24
14	.551 18	.555 12	.559 06	.561 02	.562 99	.566 93	.570 87	.574 80	.578 74	.580 71	.582 68	.586 61
15	.590 55	.594 49	.598 43	.600 39	.602 36	.606 30	.610 24	.614 17	.618 11	.620 08	.622 05	.625 98
16	.629 92	.633 86	.637 80	.639 76	.641 73	.645 67	.649 61	.653 54	.657 48	.659 45	.661 42	.665 35
17	.669 29	.673 23	.677 17	.679 13	.681 10	.685 04	.688 98	.692 91	.696 85	.698 82	.700 79	.704 73
18	.708 66	.712 60	.716 54	.718 50	.720 47	.724 41	.728 35	.732 28	.736 22	.738 19	.740 16	.744 10
19	.748 03	.751 97	.755 91	.757 87	.759 84	.763 78	.767 72	.771 65	.775 59	.777 56	.779 53	.783 47
20	.787 40	.791 34	.795 28	.797 24	.799 21	.803 15	.807 09	.811 02	.814 96	.816 93	.818 90	.822 84
21	.826 77	.830 71	.834 65	.836 61	.838 58	.842 52	.846 46	.850 39	.854 33	.856 30	.858 27	.862 21
22	.866 14	.870 08	.874 02	.875 98	.877 95	.881 89	.885 83	.889 76	.893 70	.895 67	.897 64	.901 58
23	.905 51	.909 45	.913 39	.915 35	.917 32	.921 26	.925 20	.929 13	.933 07	.935 04	.937 01	.940 95
24	.944 88	.948 82	.952 76	.954 72	.956 69	.960 63	.964 57	.968 50	.972 44	.974 41	.976 38	.980 32
25	.984 25	.988 19	.992 13	.994 09	.996 06	1.000 00	1.003 94	1.007 87	1.011 81	1.013 78	1.015 75	1.019 69
26	1.023 62	1.027 56	1.031 50	1.033 46	1.035 43	1.039 37	1.043 31	1.047 25	1.051 18	1.053 15	1.055 12	1.059 06
27	1.062 99	1.066 93	1.070 87	1.072 83	1.074 80	1.078 74	1.082 68	1.086 62	1.090 55	1.092 52	1.094 49	1.098 43
28	1.102 36	1.106 30	1.110 24	1.112 20	1.114 17	1.118 11	1.122 05	1.125 99	1.129 92	1.131 89	1.133 86	1.137 80
29	1.141 73	1.145 67	1.149 61	1.151 57	1.153 54	1.157 48	1.161 42	1.165 36	1.169 29	1.171 26	1.173 23	1.177 17
30	1.181 10	1.185 04	1.188 98	1.190 94	1.192 91	1.196 85	1.200 79	1.204 73	1.208 66	1.210 63	1.212 60	1.216 54
31	1.220 47	1.224 41	1.228 35	1.230 31	1.232 28	1.236 22	1.240 16	1.244 10	1.248 03	1.250 00	1.251 97	1.255 91
32	1.259 84	1.263 78	1.267 72	1.269 68	1.271 65	1.275 59	1.279 53	1.283 47	1.287 40	1.289 37	1.291 34	1.295 28
33	1.299 21	1.303 15	1.307 09	1.309 05	1.311 02	1.314 96	1.318 90	1.322 84	1.326 77	1.328 74	1.330 71	1.334 65
34	1.338 58	1.342 52	1.346 46	1.348 42	1.350 39	1.354 33	1.358 27	1.362 21	1.366 14	1.368 11	1.370 08	1.374 02
35	1.377 95	1.381 89	1.385 83	1.387 79	1.389 76	1.393 70	1.397 64	1.401 58	1.405 51	1.407 48	1.409 45	1.413 39
36	1.417 32	1.421 26	1.425 20	1.427 16	1.429 14	1.433 07	1.437 01	1.440 95	1.444 88	1.446 85	1.448 82	1.452 76
37	1.456 69	1.460 63	1.464 57	1.466 53	1.468 51	1.472 44	1.476 38	1.480 32	1.484 25	1.486 22	1.488 19	1.492 13
38	1.496 06	1.500 00	1.503 94	1.505 90	1.507 88	1.511 81	1.515 75	1.519 69	1.523 62	1.525 59	1.527 56	1.531 50
39	1.535 43	1.539 37	1.543 31	1.545 27	1.547 25	1.551 18	1.555 12	1.559 06	1.562 99	1.564 96	1.566 93	1.570 87
40	1.574 80	.1	.2	.25	.3	.4	.5	.6	.7	.75	.8	.9

The Aeroplane

Acetylene Welding Plant—

Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—

Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation, Newcastle-on-Tyne."

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2 City 7724.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.

Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."

Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."

Martinsyde, Ltd., Brooklands, Byfleet. Woking 331; Byfleet 171. "Martinsyde, Weybridge."

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455 "Nieuscout, Crickle, London."

Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."

The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. Putney 2240-2241, "Carbodis, London."

Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."

Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerfyta, Knights, London."

Waring & Gillow, Ltd., Hammersmith. Museum 5000. "Warisen, Ox, London."

Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

White, J. Samuel, & Co., Ltd East Cowes. Cowes 3. "White, East Cowes."

Airships—

Airships, Ltd., High Street, Merton. Wimbledon 1314.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, 'Phone, London."

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851, "Aviation, Norwich."

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 8868. "Bizfibild, London."

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.

The Wilfley Co., Ltd., Salisbury House, London Wall, E.C.2 City 2681-2. "Wrathless, Phone, London."

Cable Coverings and Cable Controls—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Capstan Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Castings (Aluminium, Brass, Bronze, Machined or Rough)—

Coan, R. W., 219, Goswell Road, London, E.C.1 City 3846. "Krankases, Isling, London."

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."

London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."

Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."

B. D. V. Aircraft Spares, Syon Chambers, 16a, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—

British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."

British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3022. "Ajawb, London."

Clark, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."

Elastic Cords—

Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—

Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. Midland 981. "Fahrenheit, Birmingham."

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—

E. Kalker & Co., Coventry. Coventry 241. "Kalker, Coventry."

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford No 1. "Pump, Bedford."

Arrol-Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."

The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000.

Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. Gerrard 238. "Beardmore, London."

Dudbridge Iron Works, Ltd. (Salmson), 87 Victoria Street, London, S.W.1. Vic. 7026 "Aeroflight, Vic., London."

Gordon Watney & Co., Ltd., Weybridge Weybridge 550 (7 lines). "Mercédès, Weybridge."

Green Engine Co., Ltd., Twickenham Richmond 1293.

Gwynnes, Ltd., Hammersmith Iron Works Hammersmith, W. Hammersmith 1910 "Gwynne, Hammersmith."

The Selsdon Aero & Engineering Co., Ltd. Imperial House, Kingsway, W.C.2. Regent 1181

Sturtevant, B. F., Co., Ltd., Hyde Park, Boston U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Moorfield Wolverhampton."

The Gnôme & Le Rhône Engine Co., Ltd. 47, Victoria Street, S.W., Walthamstow 408 (2 lines). "Elevenfold, London."

Willans & Robinson, Ltd., Victoria Works Rugby. Rugby 112 (3 lines). "Willans Rugby."

Flexible Shafts—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Flying Schools—

Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. Bournemouth 1160 "Etches, Winton."

Cambridge School of Flying & Aerodrome Co. Ltd., 30b, St. Andrews Street, Cambridge

Galvanising—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."

Cowper-Coles Manufacturing Co., Sunbury on-Thames. Sunbury 37

Gears—

Moss Gear Co., Ltd., Thomas Street, Aston Birmingham. East 407. "Mosgear, Birmingham."

Glue—

Improved Liquid Glues Co., Ltd., Gt. Hermitage Street, E. (Croid.). Avenue 3178 "Excroiden, Wapp, London."

Mendine Co., 8, Arthur Street, E.C. Bank 5873

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340 "Shatterlys, Piccy, London."

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines) "Comyn, Ching, Westcent, London."

Chas. P. Kinnell & Co., Ltd., 65 & 65a Southwark Street, London, S.E.1. Hop 372 (2 lines). "Kinnell, London."

Instruments—

British Wright Co., Ltd., 33, Chancery Lane W.C.2. Holborn 1308

Instruments (Scientific, Altimeters, Speed and Pressure Gauges, etc.)—

Short & Mason, Ltd., Macdonald Road Walthamstow, E.17. Walthamstow 180 "Aneroid," Phone, London.

Machine Tools—

Brewster & Co., 11, Queen Victoria Street, E.C.4. City 768. "Circumfuse, Cannon, London."

Magneto Driving Pieces—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Magnetos—

The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. 1008-1009 Coventry "Corlton, Coventry."

The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. Museum 430. "Vicksmag, Phone, London."

Metal Manufacturers—

Chas. Clifford & Sons, Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

Metals in General—

Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996 "Poetry, Fen, London."

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Metal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines) "Accles, Oldbury."
Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. Holborn 858. "Upcast, Holb, London."
Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2297.
Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) Wolverhampton 1041. "Bayliss, Wolverhampton."
The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. Central 3750. "Handicraft."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow, London. Hounslow 254. "Golshel, Hounslow."
Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. Museum 70. "Installing, Eusroad, London."
Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261. "Fremo, Birmingham."
Rubery, Owen & Co., Ltd., Darlaston. Darlaston 87. "Roofs, Darlaston."
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. Wellington 66. "Sankey, Wellington, Salop."
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."
Thompson Bros., Ltd., Bradley, Bilston. Bilston 10. "Thompson Bros., Bilston."

Metal Shearing Tools—

Montgomery, Smith & Co., Ltd., Tangent Works, Keynsham, near Bristol. Keynsham 21. "Ingenuity, Salford."

Metal Spinnings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Metric Bolts—

Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

Miscellaneous—

Anderson, D., & Son, Ltd. (Roofs), Belfast. Belfast 4033-4034-4035. "Anderson, Belfast."
Anti-Glare Glass Co., Ltd., 78, Turnmill Street, E.C. Central 3731.
Bowdon Wire, Ltd., Willesden Junction. Willesden 2400 (3 lines). "Bowirelim, Harles, London."
Brown Bros., Ltd., Great Eastern Street, E.C.1. London Wall 6300. "Imbrowned, Bethroad, London."
Edison Swan Electric Co., Ponder's End. (Lamps). Enfield 520 (6 lines). "Ediswan, Enfield."
Herbert Frood Co., Ltd., Chapel-en-le-Frith. Central 793. "Frodobrake, Birmingham."
Glasso Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.
Ion Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—

Arrol Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
Standard Motor Car Co., Coventry. Coventry 530 (4 lines). "Flywheel, Coventry."

Observation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Packers, Shippers, Etc.—

Pep Transport & Depository, Ltd., Castle Street, Long Acre, W.C. Regent 5464. "Depolep, London."

Patent Agents—

King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.
Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.
Stanley, Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Petrol Storage (Bulk)—

Bywater & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. Gerrard 2220. "Bywaterist, London."

Piston Rings—

British Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—

Bliss, E. W., Co., 2a, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissden, London."

Presswork—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. Kingston 672. "Ebora, Kingston."
Integral Propeller Co., Ltd., Hendon 9. Kingsbury 104. "Aviprop, Hyde, London."
Lang Propeller, Ltd., Weybridge. Weybridge 520-521. "Aerosticks, Weybridge."
Oddy, W. D., & Co., Leeds. Central 291, Leeds. "Airscrews, Leeds."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Stanley Aviation Co., 67, Kingsland Road, E.2. City 8347.
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil."

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. Wakefield 466. "Cradock, Wakefield."

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Safety Belts—

C. H. Holmes & Son, 38, Albert Street, Manchester. City 4432. "Semloh, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. City 3846. "Krankases, Isling, London."

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. Chapeltown 474. "Instrument, Leeds."

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
The Norman Thompson Flight Co., Ltd., Middleton, Bognor. Bognor 48. "Soaring, Bognor."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Short Bros., Rochester. Chatham 627. "Seaplanes, Rochester."
Supermarine Aviation Co., Ltd., Southampton. Southampton 1337. "Supermarine, Southampton."

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Central 3473.

Shackles—

The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. Hounslow 254. "Golshel, Hounslow."

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497, Birmingham.
Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. Central 7188. "Colpressed, Birmingham."
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sheet Metal Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."

Shock Absorbers (Elastic Cord)—

Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Sparking Plugs—

Forward Motor Co., Summer Row, Birmingham. Central 6259.
Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.
Lodge Sparking Plug Co., Ltd., Rugby. Rugby 235. "Igniter, Rugby."
Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. Gerrard 7758. "Ripault, Reg, London."

Springs—

Dart Spring Co., West Bromwich. West Bromwich 322. "Dart, West Bromwich."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. "Gabriel, Birmingham."
Terry, Herbert, & Sons, Ltd., Redditch. Redditch 61 (3 lines). "Springs, Redditch."

Steel—

Firth, Thos., & Sons, Sheffield. Sheffield 3230 to 3237. "Firth, Sheffield."
Nicklin, Bernard, & Co., Birmingham. Smithwick 224. "Bernico, Birmingham."

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."

Taper Pins—

Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham. Kings Norton 261-262. "Fremo, Birmingham."

Tapes and Smallwares—

John MacLennan & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.
James North Hardy & Son, Ltd., 54, Portland Street, Manchester. Central 6471. "Hardson, Manchester."

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entikosil, Vic, London."
R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. Ealing 125-126. "Beldam Tyres, Brentford."
The Palmer Tyre, Ltd., Shaftesbury Avenue. Gerrard 1214 (4 lines). "Tyricord, Weskent."

Varnishes—

Clark R. Ingham, & Co., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic, London."
Harland, W., & Son, Merton. Wimbledon 45.
Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. East 760 (2 lines). "Varnish, London."
Naylor Bros., Ltd., Southall, Middlesex. Southall 30. "Naylor, Southall."

Washers—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Watchmakers and Jewellers (Silver Models)—

Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—

Barimar, Ltd., 10, Poland Street, W.1. Gerrard 8173. "Bariquamar, Reg, London."

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. Regent 5910. "Winflector, London."
London Label Co., Ltd., Hadley Works, Beckton Road, E. "Nonflamoid" Noninflammable Celluloid. East 1300. "Lonlabel, Canning, London."
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Wires and Cables (Aeroplanes)—

Bruntons, Musselburgh, Scotland. Musselburgh 28. "Wiremill, Musselburgh."
Cradock, Geo., & Co., Ltd., Wakefield. Wakefield 466 (3 lines). "Cradock, Wakefield."

Wirework—

Herbert Terry & Sons, Ltd., Redditch. Redditch 61. "Springs, Redditch."

Woodworking Machinery—

Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. Rochdale 467. "Robinson, Rochdale."
Sagar, J., & Co., Ltd., Halifax. Halifax 136. "Sawtooth, Halifax."
Wadkin & Co., Leicester. Leicester 3614. "Woodworker, Leicester."

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Acetylene Welding Plant—
Imperial Light, Ltd., 123, Victoria St., S.W. Victoria 3540. "Edibrac, Sowest, London."

Aeroplane Manufacturers—
Aircraft Manufacturing Co., Ltd., Hendon. Kingsbury 180. "Airmanship, Hyde, London."
Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. Gosforth 500. "Armstrong Aviation, Newcastle-on-Tyne."
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. Bristol 3906. "Aviation, Bristol."
British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. Hampstead 5551. "Caudroplan, Crickle, London."
Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.
Curtiss Aeroplane Co., Clun House, Surrey Street, Strand, W.C.2
Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145.
Eastbourne Aviation Co., Ltd., Eastbourne. Eastbourne 1176. "Aircraft, Eastbourne."
Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. Kingsbury 120. "Volplane, Hyde, London."
Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. Hampstead 7420. "Hydrophid, Crickle, London."
Mann, Egerton & Co., Aircraft Works, Norwich. Norwich 482 (4 lines). "Motors, Norwich."
Martinsyde, Ltd., Brooklands, Byfleet. Woking 331; Byfleet 171. "Martinsyde, Weybridge."
National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.
"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. Willesden 2455 "Nieuscout, Crickle, London."
Norman-Thompson Flight Co., Ltd., Bognor. Bognor 48. "Soaring, Bognor."
The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. Putney 2240-2241, "Carbodia, London."
Roe, A. V., & Co., Ltd., Manchester. City 8530-8531, Manchester. "Triplane, Manchester."
Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Saunders, S. E., Ltd., East Cowes, I.O.W. Cowes 193. "Consuta, East Cowes."
Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."
Sopwith Aviation Co., Ltd., Kingston-on-Thames. Kingston 744. "Sopwith, Kingston."
Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. City 89. "Gunsignrush, Estrand, London."
Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. Kensington 6810. "Vickerlyte, Knights, London."
Waring & Gillow, Ltd., Hammersmith, Museum 5000. "Warisen, Ox, London."
Westland Aircraft Works, Yeovil. Yeovil 129. "Aircraft, Yeovil"
White, J. Samuel, & Co., Ltd East Cowes. Cowes 3. "White, East Cowes."

Airships—
Airships, Ltd., High Street, Merton. Wimbledon 1314.
Short Bros., Rochester, Eastchurch and Whitehall House, S.W. Regent 378. "Tested, Phone, London."

Aluminium Castings—
Coan, R. W., 219, Goswell Road, London, E.C.1. City 3846. "Krankases, Isling, London."
Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Aluminium Presswork (Stampings, Etc.)—
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans Rugby."

Brass Sheets for Tipping Propellers—
Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."
Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. "Poetry, Fen, London."

Bearings (Etonia Cast Phosphor Bronze)—
Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. Central 3927. "Yes, Leeds."

Buildings—
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Fairey Construction Co., Ltd., 117, Victoria Street, S.W.1. Victoria 2868. "Blazibild, London."
Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313.
The Wolfley Co., Ltd., Salisbury House, London Wall, E.C.2 City 2681-2. "Wrathless, Phone, London."

Cable Coverings and Cable Controls—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

Capstan Work—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."

Carburettors—
Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."
Lucraft, H. & Co., 147, Fenchurch Street, London, E.C.3. Avenue 2217. "Lucraftia, London."

Castings (Aluminium, Brass, Bronze, Machined or Rough)—
Coan, R. W., 219, Goswell Road, London, E.C.1 City 3846. "Krankases, Isling, London."
Gabriel & Co., 4 and 5, A B Row, Birmingham. Central 1223. " Gabriel, Birmingham."
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Cellon—
Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3622. "Ajawb, London."

Celluloid (Non-Flam.)—
Greenhill & Sons, 8, Water Lane, E.C. Central 1306-7. "Greenberg, London."
London Label Co., Beckton Road, E.16. East 1300. "Lonlabel, Canning, London."

Clothing—
Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.
Dunhill's, Ltd., Euston Road, N.W.1. North 3405-6. "Dunsend, London."
Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.
Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—
Accles & Pollock, Ltd. Oldbury, Birmingham. Oldbury 111 (4 lines). "Accles, Oldbury."
B. D. V. Aircraft Spares, Syon Chambers, 162, Kew Road, Richmond, Surrey. Richmond 1681. "Aeros, Richmond."
Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. East 1300. "Aercracons, Canning, London."
The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. Greenock 618 "Cordage, Greenock."

Cords, Tapes, and Threads—
MacLennan, J., & Co., 30, Newgate Street, E.C.1. City 3115. And at Glasgow.

Dopes—
British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. Gerrard 2312. "Tetrafree, Piccy, London."
British Cellulose Co., 8, Waterloo Place, S.W.1. Regent 4046. "Cellutate, London."
Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. London Wall 5359-3022. "Ajawb, London."
Clark, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. Victoria 2923. "Pearline, Vic. London."

Elastic Cords—
Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. City 22. "Elastics, London."

Electrical Accessories—
Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. Midland 981. " Fahrenheit, Birmingham."
The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. Enfield 520 (6 lines). "Ediswan, Enfield."

Electric Cables—
E. Kalker & Co., Coventry. Coventry 248. "Kalker, Coventry."

Engines and Parts—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. Bedford No. 1. "Pump, Bedford."
Arrol-Johnston, Ltd., Dumfries. Dumfries 281-282. "Mocar, Dumfries."
The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000.
Beardmore Aero Eng., Ltd., 122, Great Portland Street, W.1. Gerrard 238. "Beardmore, London."
Dudbridge Iron Works, Ltd. (Salmson), 87, Victoria Street, London, S.W.1. Vic. 7026. "Aeroflight, Vic., London."
Gordon Watney & Co., Ltd., Weybridge. Weybridge 550 (7 lines). "Mercédès, Weybridge."
Green Engine Co., Ltd., Twickenham. Richmond 1293.
Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. Hammersmith 1910. "Gwynne, Hammersmith."
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.
Sturtevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.
Sunbeam Motor Car Co., Ltd., Wolverhampton. Wolverhampton 985. "Moorfield, Wolverhampton."
The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W. Walthamstow 408 (2 lines). "Elevenfold, London."
Willans & Robinson, Ltd., Victoria Works, Rugby. Rugby 112 (3 lines). "Willans, Rugby."

Flexible Shafts—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

Flying Schools—
Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. Bournemouth 1160 "Etches, Winton."
Cambridge School of Flying & Aerodrome Co., Ltd., 30b, St. Andrews Street, Cambridge.

Galvanising—
Boulton & Paul, Ltd., Rose Lane Works, Norwich. Norwich 851. "Aviation, Norwich."
Cowper-Coles Manufacturing Co., Sunbury-on-Thames. Sunbury 37.

Gears—
Moss Gear Co., Ltd., Thomas Street, Aston, Birmingham. East 407. "Mosgear, Birmingham."

Glue—
Improved Liquid Glues Co., Ltd., 61, Hermitage Street, E. (Croid.). Avenue 3178. "Excroiden, Wapp, London."
Mendine Co., 8, Arthur Street, E.C. Bank 3873.

Goggles—
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. Regent 1340. "Shatterlys, Piccy, London."

Heating and Ventilating—
Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. Gerrard 1077 (3 lines). "Comyn, Ching, Westcent, London."
Chas. P. Kinnell & Co., Ltd., 65 & 65a, Southwark Street, London, S.E.1. Hop 372 (2 lines). "Kinnell, London."

Instruments—
British Wright Co., Ltd., 33, Chancery Lane, W.C.2. Holborn 1308.

Instruments (Scientific, Altimeters, Speed and Pressure Gauges, etc.)—
Short & Mason, Ltd., Macdonald Road, Walthamstow, E.17. Walthamstow 180. "Aneroid," Phone, London.

Machine Tools—
Brewster & Co., 11, Queen Victoria Street, E.C.4. City 768. "Circumfuse, Cannon, London."

Magneto Driving Pieces—
Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

Magnetos—
The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. 1008-1009 Coventry. "Corlton, Coventry."
The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. Museum 430. "Vicksmag, Phone, London."

Metal Manufacturers—
Chas. Clifford & Sons, Ltd., Birmingham. Central 42-43. "Clifford, Birmingham."

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Pritt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. " Poetry, Fen, London."

Metal Parts and Fittings—
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The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow, London. Hounslow 254. "Golshel, Hounslow."
Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. Museum 70. " Installing, Eusroad, London."
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Petrol Storage (Bulk)—
Pratt & Co. (The Hydraulic System), Clements House, Kingsway, London, W.C.2. Gerrard 2220. "Bywaterlat, London."
Piston Rings—
Pratt & Co., 46, Fenchurch Street, London, E.C.3. Avenue 995, 996, and 7996. " Poetry, Fen, London."
Piston Rings—
Wellworthy Chuck & Piston Ring Co., Coventry. Coventry 723. "Rings, Coventry."

Power Presses and Dies—
Bliss, E. W., Co., 2a, Pocock Street, Blackfriars Road, London, S.E.1. Hop 4340. "Blissdon, London."

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Herbert Terry & Sons, Ltd., Redditch. Redditch 61. " Springs, Redditch."

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Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. Roundhay 345 (3 lines). "Propellors, Leeds."
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Seaplane Manufacturers—
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Sage, Frederick, & Co., Ltd., Walton, Peterborough. Peterborough 128. "Sage, Peterborough."
Short Bros., Rochester, Chatham 627. "Seaplanes, Rochester."
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Sheet Metal Pressings—
Accles & Pollock, Ltd., Oldbury, Birmingham. Oldbury 111 (3 lines). "Accles, Oldbury."
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. Roundhay 345. "Propellors, Leeds."
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Timber—
Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. Victoria 5073, 4210. "Entilcell, Vic, London."
R. F. & F. W. Brown, Wollaton Saw Mills, near Nottingham. Nottingham 1526. "Brown's Saw Mills, Wollaton."

Time Recorders—
Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

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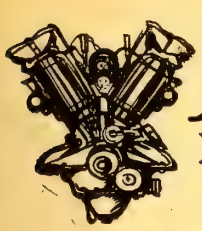
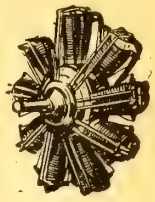


AERO-MOTORS

IN KIND AND CONSTRUCTION



By Geoffrey de Holden-Stone

Two-stroke Designers.

Much research, more trial, and most of all profitable things, the ever-instructive error, have convinced me that there are really only two kinds of persons who are competent to design a first-class and original two-stroke motor. One is the trained engineer, of such long experience and scientific insight that he has not only learned to recognise the utter limitations of conventional design and practice, to despise them, and refuse to be fettered by them, but to trust rather to his trained instincts concerning any new problem, and of mechanics merely as a case of tools to realise those instincts, never as a ruling factor in his equation. Then, when the time comes he will be the more certain to choose the right set of tools, the *mecanique juste*.

The other is the amateur who has merely grasped the essentials, and is not mentally encumbered with the habit and practice of the shops; and so, not being encouraged by these to imagine he knows more than he does, is free to set out on an independent career of research. He will probably,—and rightly—dwell upon physical rather than mechanical aspects, and so get into the habit of making the latter fit the former. In that way, after a few blunders, he will probably commit one of those startling originalities that achieve master-patents and much distinction, and in any case he will go far. Four such men, I remember, all absolutely innocent of shop-training or anything like an engineering qualification, between them managed to design one of the most efficient road-racing motors ever produced, the four-cylinder Y-type monobloc Peugeot, of the Circuit de Boulogne. One of them was its driver, the late Georges Boillot.

Both, need I say, must be idealists on the basis of those essentials, the only things that matter.

An Original Design.

One of the latter kind, I take it, is Mr. Bruce Harding, of Belsize Park and the Barbican, whose two-stroke designs, both of 1910 and 1914, are not only distinctly original as mechanical propositions of unusual simplicity, but show him to be one of the soundest physicists who has worked in the two-stroke cycle. Hence, certain peculiar mechanical merits have resulted, in either case. The later model, too—illustrated herewith—possesses so many features of appropriate quality for aviation purposes, that it cannot be overlooked at a time when discovery of the most efficient aero-motors is so sought: all the more that such discovery has hitherto been so actively discouraged in Whitehall and Cockspur Street.

Both models, however, when built, not only started from the first shot, but kept on running. Now when any two-stroke consents to start and run at all, it shows that its scheme is capable of working and that even if it presently stops, the elimination of its defects is mostly a matter of investigation: that even if this involves partial re-design, mechanically, the basic principles can generally be retained. If, on the other hand, it keeps on running, then the complete success of the working scheme becomes chiefly a matter of refinement.

Still, however good as a demonstration of principles, all sorts of mechanical objections may arise. The design may be very nice and simple indeed, and it may have shown up as well on the test bench as it did in the drawing office; which are the two extremes of the proposition. In between it may be too costly or delicate: a brute in the pattern-shop and foundry, and a tricky affair in the machine shops.

So one is sorry to say that the first ideal in two-stroke practice to be served is that of popularity in these places, where they prefer to be plain artisans rather than conjurers, as they probably get all the impossibilities they want at home. Duly served, this will generally bring the second one out all right, which is that of mere £ s. d.: while third by a long way, come all such ideals as valvelessness and the physical and mechanical artistries: to lose which, nevertheless, is to lose the soul of the matter.

As in 1910.

Thus the original 1910 Harding model, though embodying many desirable results, left something to be desired in the embodiment. As will be seen, its mechanical part consisted of two pistons coupled to opposed cranks at 180 deg. in a common cylinder, the explosion taking place between them; but the cross-shaped trunk of the upper piston moving through the body of the lower one, while its upper extension—likewise hollow—served in the fourfold capacity of induction trunk for the mixture, for the air-scavenge, as an internal cooler for the motor, and as a mixture heater at the same time.

These two latter functions constituted the heart of the system, physically, the two former being merely mechanical means. And finally, it will be noticed that a plug-piece depended from the top of the induction-extension of the cylinder, corking up the trunk during the outstroke, like a bottle after being filled.

At the top there was the port G.I. (gas intake), just below, another circular series S.A.I. (scavenging air intake): a plug entry at C.S. (combustion space); and a ring-series of exhaust ports at the bottom. So one sees that the latest-recognised canons of port relations were duly recognised by Mr. Bruce Harding seven years ago!

How the Cycle Worked.

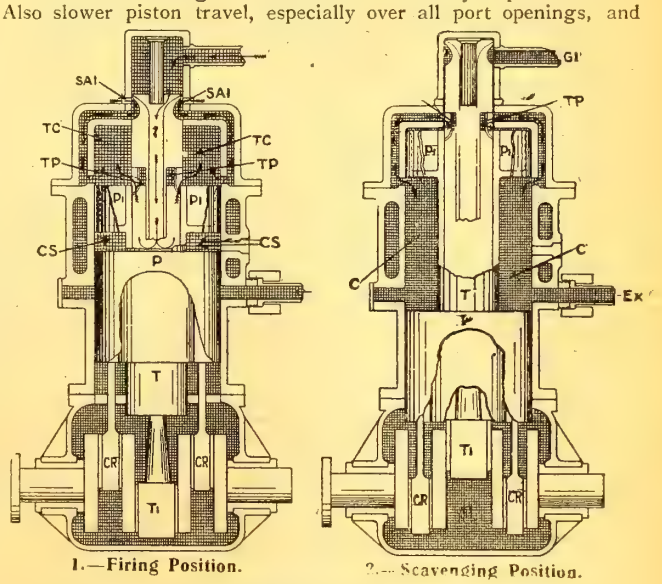
The working cycle went as follows. On the instroke, the back of the upper piston created a strong suction pressure in the upper port of the cylinder. This, when the piston went down on the instroke, would be relieved as soon as the plug cleared the top of the trunk; and the mixture would rush down the trunk, *not* into the combustion space, but into the hollow of the piston head and the upper part of the cylinder, by way of the transfer ports (T.P.) in the middle of the trunk. But just previously to those ports uncovering, the waisted top of the trunk uncovered the air ports, and a supply of air rushed in over the waist into the outer transfer channel at the top of the cylinder, and was retained therein by the wall of the piston extension.

This left the air charge in the lead for entry. Then on the outstroke the upper piston first corked its trunk at the top, and also closed off the air-intake ports with the wall of the upper trunk extension: at the same time driving over the mixture—as the right-hand diagram shows—into the annular transfer chamber—where the air was—as soon as the middle trunk ports coincided. But this action previously drove the air ahead of the mixture, and into the combustion chamber, as soon as the piston head lifted clear of the ports at the bottom of the transfer duct; to scavenge the exhaust ahead of the new charge. Then the charge came in, was duly impoverished with the residue of the air; was compressed and fired, between the pistons; all the induction previously described, occurring at the same time above the upper piston.

But—there was a lot of it! With such a long central trunk, that upper piston could only have a very short connecting rod. And it had to have rings on its fingers and again rings on its toes for the slide through the lower piston, which also required two machinings. So far as mere material went, the construction would be cheap enough. But manufacturers—who really spend more on valve-gear than apparently occurs to them—*will* have a more open tooling proposition than this design offers.

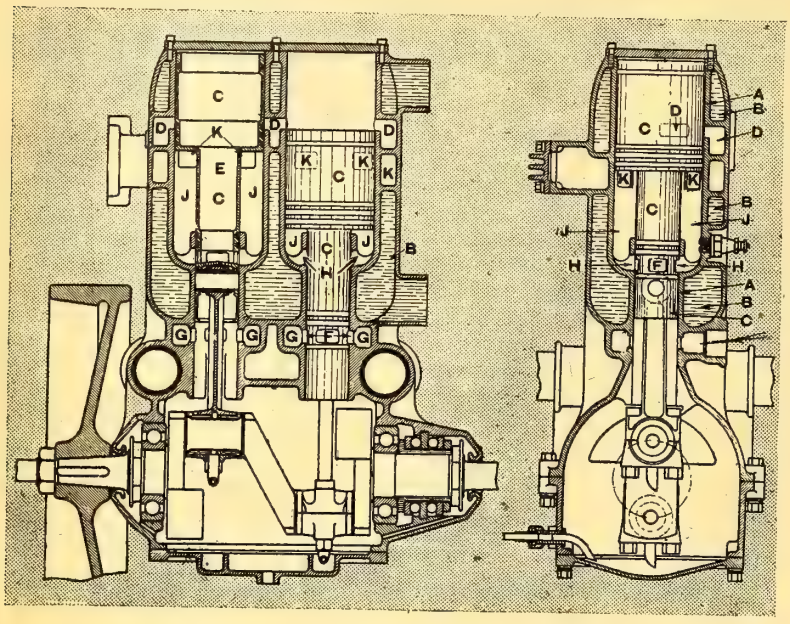
Special Advantages; and Certain Defects.

All this was excellent. There was the supreme physico-mechanical advantage of the balanced two-way explosion effort. Also slower piston travel, especially over all port openings, and



1.—Firing Position. 2.—Scavenging Position.

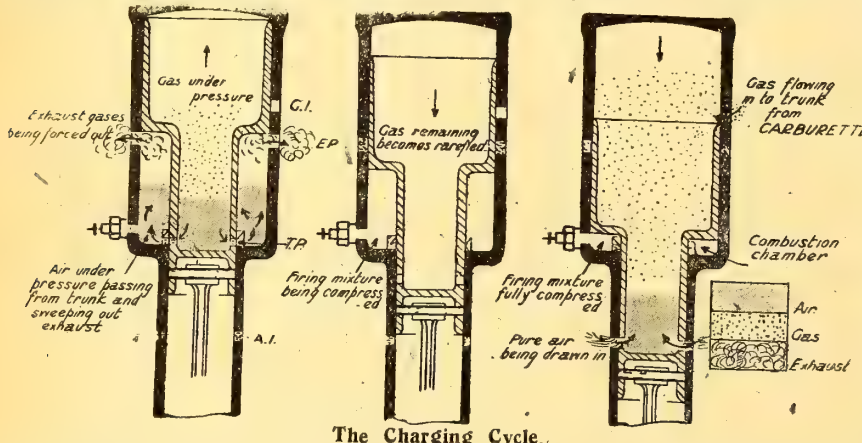
The Harding Two-stroke Motor, 1910 Model.



The Harding Two-stroke Motor, 1914 Model.

withal more than double the port areas usually available. Again, variable compression from the top: the working cylinder of the same bore throughout; complete pressure relief; a clear combustion space, no baffles, pockets or deflector plates; and above all, *internal* cooling. Also, the air induction being positive in volume—there being no valves—and once set, unvarying, the carburettor could be likewise set to a richer mixture, with a correspondingly reliable supply.

So while keeping the general principle of the original cycle—and especially the internal cooling and mixture heating effect of that central trunk, its most valuable physical feature—Mr. Bruce Harding in 1914 remodelled the mechanical scheme of the design, keeping the single diameter of the working part of the cylinder,



The Charging Cycle.

but making the slide an easily machined extension thereof, and reducing the moving parts to a single piston of two diameters with the central trunk: rather shorter.

The Change of Design.

Thus he was enabled to lengthen the connecting rod, almost to double its length: and by closing the trunk at the bottom permanently, and bringing the air ports to the bottom (as at G, Figure 2), he was able to make one set of ports F in the trunk C serve first as air intake ports on the instroke—which is the outstroke of the trunk—and then as transfer ports for the final induction into the annular combustion chamber J; instead of two sets as before.

These changes obliged—and at the same time enabled—him to shift the exhaust ports from the bottom to the top of the combustion chamber: thus not only maintaining the canon of remoteness from the induction, but getting a better position for the more readily automatic upward flow of the lighter exhaust gases.

It will be seen, just here, that except for the dwell and rebound of primary induction, he practically succeeded by this rearrangement of relative port positions, in getting a uniflow motion for the gas stream; which, so far as I know, has only been done in two other instances in two-stroke practice, one of them in a very recent patent—and once only—in the Gnôme—in four-stroke history.

Withal, throughout the same advantageous result of extensive port area—actually threefold in the case of the exhaust and induction—on a ring series, was retained in the new design; fortunately enough, as the speed of the single working piston would naturally be doubled.

And the Results Thereof.

The balanced explosion effort, of course, had to be relinquished: but it will be seen that one of its advantages—that the cylinder is unaffected, not forced off the crank-chamber, but remaining as a mere piston-guide—was practically retained; as the combustion head of the cylinder is actually at the bottom! This, too, has a special physical advantage in regard to the water-cooling; for thermo-syphon cooling can be employed, without its usual disadvantage that the hot water lingers too long about the heads; whereas in this case, they are bound to get the first flush of cold water as it enters. On the other hand, we now notice the radical mechanical difference between this construction and any other single-piston design; this being that the trunk—and hence the connecting rod—is in constant *tension* during the combustion effort. Naturally, therefore, all the strains are finally transmitted to the *threads* of the cotter-bolts on the big ends. Consequently it would appear that the only practical—nay essential—specification here, is that the big end should be a complete unbroken ring or barrel formation; with the crank built up.

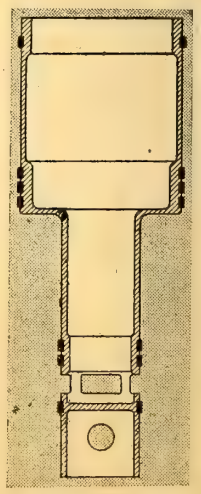
Finally, as to construction, instead of the duplicated-top pattern of the 1910 cylinder—an awkward bit of casting, simple as it looks—the suction base was reduced to the simple plate we see screwed to the top of the open cylinder casting; which, with relief plugs round the passages, is an easy enough foundry job. Particularly, too, will the copious water-jacketing of the exhaust ring, above and below, be noticed.

How the New Harding Cycle Works.

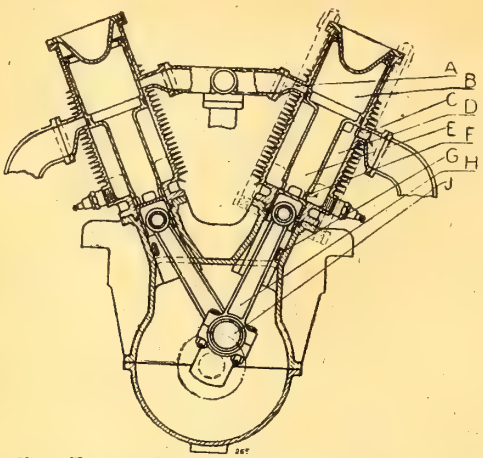
From all this, the differences in the working cycle of the 1914 model—which is the same to-day—will become more readily apparent. In the sectional side-elevation the pot-shaped left-hand piston—much deeper than the old one—will be seen at full outstroke. Beneath, it has just exhausted. Above, it is recompressing the charge for the final induction. But ahead of that induction of the charge, the trunk below—now at full *iustroke*—is admitting the charge of air it had previously picked up and bottled—through the ports G at full outstroke—into the annular combustion space J, under pressure, to scavenge the exhaust.

Let us now suppose the exhaust relief to have occurred, and the transfer of the charge down the trunk into the combustion space to have been completed. The charge is then compressed to the bottom, and fired, at the end of the piston's instroke, which is the outstroke of its trunk. This is shown in the right-hand cylinder of this pair. The pot of the piston has cut out the exhaust ports K (shown in dotted lines), and the trunk, the inlets to the combustion chamber. Also the previous induction acting through the trunk wall, has helped to cool the combustion space; and the trunk itself—radiating internally as a "hot spot"—has usefully warmed the mixture.

But simultaneously, with this instroke, a rarefaction or partial vacuum, and hence suction, has been created throughout the interior of the piston and trunk. There are two ends to it, of course. So, as soon as the piston is at full instroke and the trunk at outstroke, the mixture inlet ports D, from the figure-of-eight induction passage, and the air inlet ports G (coinciding with F) are simultaneously opened. So the mixture rushes inwards and



The Harding Tandem Piston, 1914 Model.



The Harding Two-stroke 1916 Eight-cylinder Aviation Model.

downwards, the air inwards and upwards: and there they stay bottled and stratified, during the whole of the firing-stroke. But, of course, the air at the bottom remains in the lead for entry and scavenge, just as in the 1910 type. It should be noted, too, that the figure-of-eight shaping of the induction passage—a rare achievement, only embodied in the "Sans" design of April, 1910—has the special advantage of continuous circulation without back-lash; and thus steadies the carburation.

The Aviation 1916 Model.

The V-type, 1916 model, for aviation, merely repeats this working cycle. The only difference is the structural one, that it is air-cooled, and that single ports instead of annular-port passages are used: though there appears to be no reason for the change, and several against it. Otherwise its advantages—additionally to the useful counter-balancing of parts as a V-type, remain the same. As a manufacturing proposition—as well as for maintenance—this 1914-16 design, however, is obviously far ahead of the older one. For one thing there are only three moving parts per cylinder unit; piston-body, rod, and crank: and these can be removed without disturbing the motor-mass, as the gudgeon pin can be punched out from beneath, through the air port, near the bottom of the trunk outstroke. Obviously, too, all the previous physical advantages already dealt with remain; such as the controllable air-setting for the scavenge; which equally serves for the day-to-day tuning adjustment for the carburation. In running, too, this motor displays uncommon flexibility, throttling down to 200 r.p.m. and keeping steady at that rate, yet accelerating in a few seconds to a full 1,500 r.p.m. and over. And slight as it might appear, the active charging volume of the annular combustion space is unusual; practically twice what anyone would imagine until they had measured it.

Altogether, with its internal cooling after each stroke, it appears to be one of the half-dozen best and simplest of the two-stroke cycles extant. And a working example has been ready since some months before the war!

(To be continued.)

A NEW INDUSTRY—AERO COVERINGS, LTD.

This is an age of specialisation and division of labour. No more does the patriarch build his own dwelling, construct his own plough, and weave the coat of many colours for the spoiled son. Now the proud head of the family consults an estate agent for someone else's cast-off home, earns his living with a fountain pen, which is probably the work of forty machines and fifty people, and clothes his somewhat meagre family with garments bought in Bond Street and manufactured in East End Slums, only, as a rule, the girls receive most of the multi-coloured garments.

The division of labour is but a sign of the times, and one is not surprised to announce a new specialised industry in connection with aviation.

For a considerable time past manufacturers of aeroplanes have experienced inconvenience and loss of time and the waste of a great deal of highly-valuable workshop space in the covering, doping, and varnishing of the wings and control planes of the machines they construct, to say nothing of the expense of fitting up elaborate fans and other ventilating plant to conform with Home Office regulations.

In the first place, the best organised aeroplane factory experiences considerable difficulty in keeping its fabric shops steadily employed, because the amount of work which can be done is governed absolutely by the output of the plane-erecting shop, and the works manager is confronted with the choice of keeping many hands idle at irregular periods, or of constantly discharging and re-engaging them—both most unsatisfactory alternatives.

Also, the fabric and dope shops occupy a considerable amount of floor space, which the average engineer would prefer to see occupied by machine tools, turning out work nearer to his own heart.

The carrying out of the Home Office health regulations in the dope shops are difficult of achievement in many cases, and the problem of keeping large shops at the necessary degree of heat is often considered a bugbear.

Many voices cry vainly in the wilderness, but the demands of the engineer-aircraft manufacturers, who regard the sartorial requirements of aeroplanes with something approaching *ennui*, have been heard.

A company, called "Aero Coverings, Ltd.," has been registered for the purpose of taking the fabric work entirely out of the hands of those aircraft manufacturers who may find difficulty in doing it for themselves.

Works have been installed at Kilburn, and equipped in a remarkably short space of time, production already having commenced.

The plant includes some ingenious devices which it is well not to describe in print, and needless to say the ventilation arrangements have been made to conform to Home Office requirements, and the heating according to Aeronautical Inspection Department regulations.

The directors of Aero Coverings, Ltd., are experts in all that pertains to aeroplane fabric, dope, and varnish, and are qualified to produce aerofoils covered, doped and finished in a highly workmanlike manner. The plant is in the charge of a qualified engineer, and the installations laid down in the last few weeks are evidence of his ability.

The new firm undertakes to collect from aircraft manufacturers, wing frames, tail frames, elevator frames, etc., as passed by the A.I.D., and to return them ready for the riggers.

To save valuable time, the fabric is stitched into bags by electrically-driven sewing machines, and fitted and sewn over the frames by hand.

In the doping department the plane is carefully weighed during the various stages so as to regulate the amount of dope and finishing materials present to A.I.D. requirements. Identification marks and stencils are added, and the job weighed before leaving the factory.

Each operation is checked by an A.I.D. inspector, and every completed unit is delivered to the manufacturer with a certificate showing the weight of the section, the weight of the fabric, the weight of the dope, and the weight of the finishing materials applied thereto.

Incidentally, the tautness of the fabric is checked during the various stages by a recording instrument, and particulars given on the same certificate.

One is pleased to record the decision of the proprietors to place for the period of the war any inventions or labour-saving devices which they may discover in connection with plane covering at the free disposal of the aircraft industry, as a patriotic offer which may assist the more rapid output of aircraft.

All work is collected from and delivered to aircraft manufacturers by the firm's motor lorries, and orders for large or small quantities of planes, in complete sets, or as spares, can rapidly be dealt with. In many cases spares will be delivered back, completely covered, doped, etc., within two days of their collection.

Aircraft constructors, more especially those who have not yet erected their doping works, are invited seriously to consider whether they cannot appreciably increase their output and cut down their working costs by handing their fabric work to this new firm of specialists.

Enquiries should be addressed to Aero Coverings, Ltd., Tennyson Works, Willesden Lane, London, N.W.

A RESIGNATION.

The Grahame-White Aviation Co., Ltd., announces that Mr. F. H. Payne has resigned his position as Director of the Company, and that Mr. Claude Grahame-White is now the sole Managing Director.

THE R.A.F. SPORTS.

The first annual sports' meeting of the Royal Aircraft Factory was held at the R.A.F. Sports' Ground at Farnborough, in aid of the R.A.F. Benevolent Fund, on Saturday, Sept. 1st, under the patronage of Sir William Weir, of the Air Board, and the presidency of Mr. Henry Fowler, superintendent of the Factory.

The preliminary heats for many of the events were run off earlier in the week, a commendable arrangement which might be followed at other sports' meetings, as the interest of the spectators is not tried by watching numerous eliminatory events.

The programme included races and competitions suited to the abilities of young and old, and a very large entry was received.

A somewhat unusual feature was the admission of several competitors whose names were not printed on the official programme, but doubtless the additions were made with the sanction of the A.A.A.

Music was furnished during the sports by the band of the Royal Flying Corps, and dancing followed to music by the Aerial Orchestra.

MARKET REPORTS.

Prices given are for quantities on usual terms.

Sept. 6th, 1917.

COPPER.—The dullness of this market continues and buyers are holding back. This was foreshadowed in previous reports and is due primarily to the delay of the U.S.A. Government fixing the official prices at which Copper must be supplied. The labour situation there is a little more promising and the outlook is hopeful. At the same time the accumulated stocks have been considerably reduced. The prices here remain unchanged and supplies are fairly well maintained. One is still inclined to think that there must be a further slight reduction in the official prices.

Current Prices.

Standard Copper Ingot .....£120 per ton, Cash.
Copper Sheet .....£160 per ton.
Copper Tubes, S.D. ..... 19¾d. per lb.
Brass Sheet, 24 Gauge ... 15⅞d. per lb.
Brass Tubes, S.D. ..... 16½d. per lb.

TIN.—Since last week's report the Tin market has recovered a little and appears to be showing signs of gaining a healthier condition.

The demand has been very brisk, and supplies are coming forward fairly well.

An order was issued on August 24th, 1917, by the Ministry of Munitions, controlling the supplies and prices of Tinplates and Terneplates. There are many extras for special sizes, different packing, etc., etc., also several allowances. These can be ascertained upon referring to the order, which can be procured from the Director of Steel Production, Ministry of Munitions of War, Whitehall Place, London, S.W.1. The maximum official prices are given below; Staffordshire Tinplates are excepted.

Per Basis Box. Net. 20 B. Maker's works or nearest station.

Coke Tinplates.

I.C., 20 by 14, 112 Sheets, 108 lbs. .....30s.
D.C., 25 by 17, 50 Sheets, 94 lbs.....29s.
S.D.C., 22 by 15, 100 Sheets, 163 lbs. ...45s. 6d.
28 by 20, 30 by 21, 19¼ by 14, 18¾ by 14, at basis price for 20 by 14.

Terneplates

28s. per basis box, i.e., 2s. below the basis price of Coke Tinplates.

These prices are based upon Tin at £240 per ton for Coke Tinplates, 1½d. basis to be added or deducted from the basis price for each rise or fall of £5 per ton above or below this price, and 1½d. basis to be added or deducted from the basis price of Terneplates for each rise or fall of £20 per ton above or below this price.

Merchants are permitted to sell from their own warehouses at a maximum addition of 7½ per cent., plus carriage, or 2 per cent., plus carriage, if sold for delivery from maker's works.

Sept. 3rd	£243	5	0	per ton.
August 30th	244	0	0	per ton.
August 27th	241	5	0	per ton.
August 4th	245	10	0	per ton.
Highest Price, 1916	205	0	0	per ton.

LEAD.—This market lacks any interest whatever. The shortage of supplies continues, and it is only possible to obtain metal for work of national importance. Official prices continue unaltered.

Current Official Prices.

Lead, Virgin Pig .....£29 per ton, Ex Ship.
Lead, Virgin Pig .....£30 per ton, Ex Stores.
Lead Sheet .....£39 10s. per ton, Deld. U.K.
White Lead, Dry .....£46 per ton, Deld. U.K.
White Lead, in Oil, £53 to £55 per ton, Deld. U.K.
Red Lead .....£42 per ton, Deld. U.K.

STEEL.—The demand for all classes of Steels continues undiminished. It is, in fact, ahead of the increase in output. The later is, however, making great strides.

Manufacturers are anxiously awaiting the official prices for the Aircraft Steels at present being controlled by the Air Board.

One understands that the Ministry of Munitions is carrying on negotiations with the Sheet Iron trade, with the object of controlling prices, and presumably the Sheet Steel trade will shortly receive the attention of the Controllers, and probably prices will suffer the now "usual" inflation. Consumers are learning to anticipate this inevitable inflation by looking ahead. Prices of Bar Steel are the prices which were ruling prior to the material being controlled. One knows of no reason why they should be advanced.

Current Average Prices.

R.A.F. 3B Steel 78s. to 80s. per cwt., Basis. (Black or Blue Reeled.)
R.A.F. 1E Steel, 36s. to 40s. per cwt., Basis. (Black or Blue Reeled.)
R.A.F. 9A Sheet Steel, 30s. to 32s. per cwt.

ALUMINIUM.—Prices are still unaltered and supplies are quite satisfactory.

Official Prices.

Ingots .....£225 Deld.
Remelted .....£210 Deld.

TIMBER.—There is nothing very special to report this week. The general position continues very acute.

Small parcels of wood are occasionally offered, but this is becoming a thing of the past, and when such an event does take place, the first consideration is not price, but quality, and aircraft firms are now taking wood which they would not have looked at 18 months ago, in the hope of getting a percentage of Timber which will pass the "Cast Iron" inspection of the A.I.D.

Walnut is still very scarce, although one hears of several loads having been recently received. There have been several shipments of Mahogany received recently, but the outlook is far from being bright.

Current Average Prices.

Silver Spruce, 17s. 6d., c.f.
English Ash, 13s. 6d. to 15s., c.f.
Walnut, 2s. 3d. to 2s. 6d., s.f.
Mahogany, 2s. 2d. to 2s. 4d., s.f.

Prices include selection and delivery.

FABRIC.—There are no further remarks to make on the atrocious prices being charged for the materials under this heading. One learns that the spinners are up in arms against the Air Board on account of the unprecedented prices they are demanding for Flax. This state of things is certainly not conducive to maximum output, and, although supplies are at present satisfactory, the Irish spinner is the wrong man to upset.

Official Price.

17C Cloth, 2s. 8d. per yard, 36 in. wide.

THE PATENTS INDEX.

The subjoined list of recent inventions has been specially compiled by The Aeroplane from the current Official Patents Records.

Patent Applications.

Baker, F. C. Means for preserving buoyancy of observation balloon in the air, and retain the gas when valving. No. 12522. August 31st.
Bramwell, F. H. Observation apertures for aircraft. No. 12534. August 31st.
Calthrop, E. R. Parachutes. No. 12483. August 30th.
Cox, F. H. Apparatus for ascertaining range for dropping bombs from aircraft. No. 12506. August 31st.
Danielson, O. A. Indicating device for aircraft. No. 12279. August 27th.
Downing, A. E. Flying-machines and engines therefor. No. 12325. August 28th.
Drummond, W. J. Toy aeroplane. No. 12496. August 31st.
Edde, H. Motors for aircraft. No. 12302. August 27th.
Grice, S. H. Clinometer for aircraft or submarine. No. 12254. August 27th.
Groves, S. E. Dopes or varnish for aeroplanes. No. 12349. August 28th.
Holland, H. W. Release mechanism for dropping bombs. No. 12422. August 29th.
Houghton, P. H. Propellers for aircraft. No. 12311. August 28th.
Lytton, E. Levels for aircraft, etc. No. 12504. August 31st.
McAlpine, G. L. Guns carried by aircraft. No. 12551. August 31st.
Mooney, D. J. Metal construction for aircraft. No. 12406. August 29th.
Smith, M. Bevan. Anti-gravitation level for aeroplanes. No. 12309. August 28th.
Sykes, H. W. Guns for use on aircraft. No. 12586. Sept. 1st.
Tarrant, W. G. Struts for aircraft. No. 12416. August 29th.
Tate, B. J. Rigid observation balloon. No. 12246. August 27th.
Touboul, E. W. Toy aeroplane. No. 12470. August 30th.

Complete Specification Accepted, prints of which can be obtained on and after September 20th, 1917.

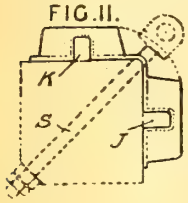
108,893. August 24th, 1916. Mills, E. W. Sighting apparatus for use on aircraft.

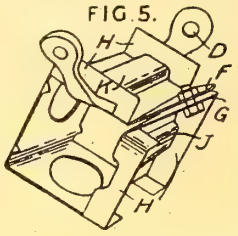
Abridgments of Recently Published Specifications.

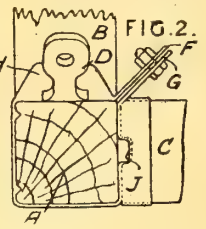
107,662. Aeronautics. Chapman, F. W., 2, Dunstable Road, West Leagrave, Luton, Bedfordshire. July 17th, 1916, No. 10019. [Classes 4 and 20 (ii).]

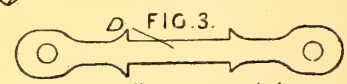
Adjoining members of light structures such as aeroplanes and hangars for aircraft are connected together by means of a thin plate having, on one or more sides when bent into its final form, a recessed lateral groove in which a wiring plate is adapted to

fit and be secured thereby. Fig. 5 shows one form of the fitting for use on the longeron of an aeroplane, and Fig. 2 the same in position. The longeron A is stayed by struts B, C, and by bracing-wires secured to wiring plates D, only one being shown in position. The fitting is originally stamped from flat plate, and after being bent to its final form is fastened by the lugs F, G. The walls H are bent up to form partial or complete sockets, as shown for the struts. Grooved recesses J, K, are formed along the base of the sockets and in these recesses the shaped wiring



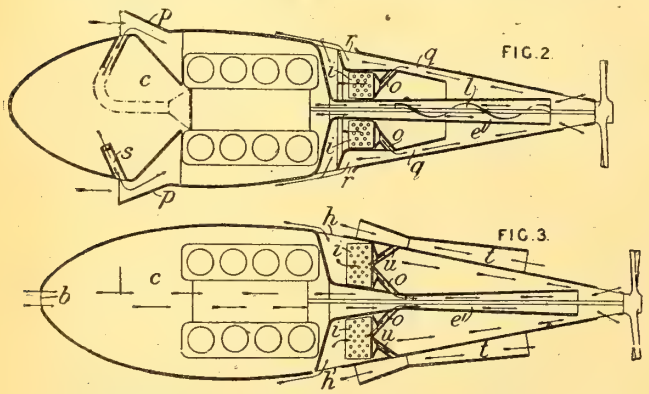




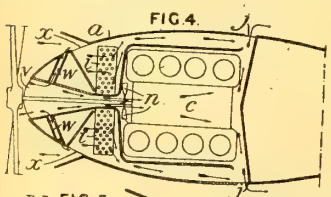


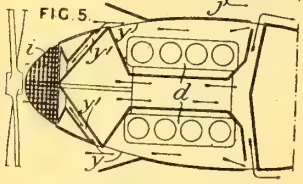
plates D, Fig. 3, are held, a corresponding groove being made in the ends of the struts. Diagonal bracing may be attached to the lugs F, G. Various forms of wiring plates are described. Fig. 11 shows a simpler form of the fitting, a diagonal eye-bolt S being used to assist in securing the fitting in position and as an anchor for diagonal bracing-wires.

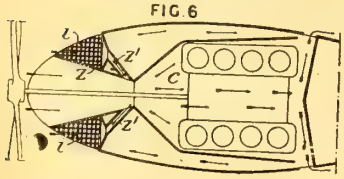
107,574. Internal-combustion Engines. Guyot, H. R., 54, Avenue Jean Jaurès, Paris. Addition to 105,051. Not yet accepted. Abridged as open to inspection under Sect. 91 of the Act.



Cylinders, Cooling.—Relates to various modifications in the shapes and disposition of the devices for cooling aircraft motors described in the parent Specification. In the pusher type of aeroplane shown in Fig. 3, air enters the motor chamber *c* through an opening *b* and is discharged through a passage e^1 having the form of a double cone. The radiator *i* is cooled by air which enters openings *h* and passes through tubes *o* leading to the passage e^1. The radiator may be further cooled by external tubes *t* arranged to draw air through tubes *u*. In the modification shown in Fig. 2, air enters the motor chamber *c* by passages *p* arranged to cause a withdrawal of air from tubes *s*. A quick-threaded screw *l* is secured upon the propeller shaft to increase the flow of air through the passage e^1. Air pipes *o* running from the radiator *z* lead to passages *q* communicating with openings *r*. In the tractor type of aeroplane shown in Fig. 4, air enters the motor chamber *c* through a conical passage *v* and leaves the shell *a* by openings *j*, the flow of air being increased by a fan *n*. The radiator *i* is cooled by air entering passages *w*, *x*. In the modification shown in Fig. 5, the radiator *i* is arranged at the front of the apparatus, and the hot air from the radiator is drawn off through tubes y^1 communicating with inlets *y*, through which air enters to cool the cylinders *d*. In another modification, the hot air from a conical radiator *i*, Fig. 6, passes through tubes z^1 to a conical passage *z* leading to the motor chamber *c*.

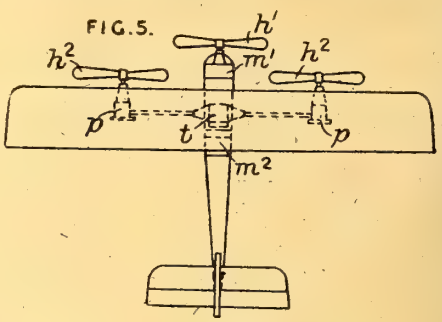






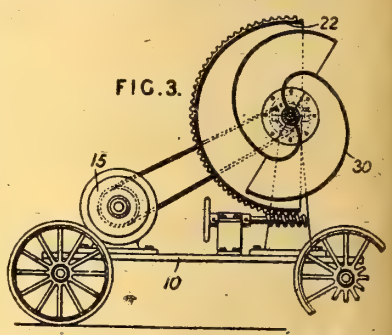
107,573. Aircraft. Soc. des Moteurs Salmson (Système Canton-Unne), 9, Avenue des Moulineaux Billancourt, Seine, France. Not yet accepted. Abridged as open to inspection under Sect. 91 of the Act.

Propelling.—An aeroplane or airship has two motors arranged in the longitudinal axis of the aircraft, one motor driving directly a screw propeller in that axis, and the other driving two side screw propellers arranged symmetrically. Fig. 5 shows an aeroplane having two motors m^1, m^2, the motor m^1 driving a propeller h^1 direct, and the motor m^2 driving two propellers h^2 through gearing *t*, *p*. The motor m^2 may have a transverse shaft and occupy the position of the gearing *t*. All three propellers may be arranged in front of or behind the main plane, or the propellers h^1, h^2 may be on opposite sides of the plane.



107,627. Propelling-devices. Schmelzer, B., 47a, Jefferson Avenue, Jersey City, New Jersey, U.S.A.

Comprises a propelling-device of the kind in which a propeller or fan is located within an adjustable casing and by means of which motion may be imparted to a vehicle whether upon the surface of land or water or in the air. A propeller consisting of a pair of conchoidal vanes 30, shaped as shown, is mounted within an adjustable casing 22 and rotated by chain or other gearing from an electric or other motor 15 carried by a platform 10. The casing 22 is adjustable by worm gearing and it extends beyond the centre of the propeller, as shown. When the propeller is rotated, the thrust on the casing propels the vehicle. An opening covered by a slide may be formed in the casing to enable the vehicle to be controlled. For elevation in aircraft, the casing 22 is disposed vertically over the shaft of the propeller.



AMERICAN INDUSTRIAL NOTES.

A measure of vital importance to aeronautics has been proposed at Washington by Representative Hulbert, of New York, who introduced into the House a bill to remove the restrictions on advance payments imposed by Section 3648 of the Revised Statutes of the United States, or any other Act, as they apply to the expenditure of appropriations contained in the bill recently passed authorising the expenditure of 640,000,000 dols. for the increase of the Aviation Section of the Signal Corps.

Section 3648 prohibits the advance of the public moneys on contracts, etc., and the measure now under consideration is designed to permit the War Department to make such advances to responsible manufacturers, in order to enable them to increase their facilities for the production of Government aircraft. Many manufacturers of aeroplanes not only have valuable designs and patents, but would be in position to turn out aircraft on a large scale if they had the funds to increase their facilities.

* * *

The International Aircraft Standardisation Committee, organised by the Allied Governments to affect standardisation of the metals entering into the construction of aeroplane parts, as well as the parts themselves, held their first meeting in New York, Aug. 7th.

* * *

The Aircraft Production Board is devoting its energies to the perfection of its organisation, pending the passage of the bill giving the Board a legal status. Chairman Coffin has been in the West the past few days conferring with automobile and other industrial concerns.

The Board has moved to the old Southern Railway building opposite Union Station, where two entire floors have been taken over. Ultimately the entire building, containing several hundred rooms, will be utilised.

(*Continued from page 728*).

Seventeen on Mouveaux and Lezennes aerodrome, near Lille;
Six on sidings between Douai and Somain; and
Two on Ledeghem railway station, south of Roulers.

9.28 p.m.—On the 5th inst. there was again great activity in the air. The enemy on several occasions interrupted the work of our artillery machines and attacked our aeroplanes employed on long-distance bombing raids. A few bombs were dropped behind our lines by hostile machines during the night, little damage being done.

During the day our machines dropped eight bombs on railway sidings near Ghent, five on a large shed at Maubeuge, 54 on billets round Douai, 38 on aerodromes east and north-east of Cambrai, and 61 on various other targets.

During the night 10 bombs were dropped by our aeroplanes on aerodromes near Courtrai, eight on an aerodrome east of Lille, and 28 on other targets.

In air fighting yesterday five enemy machines were brought down and five others driven down out of control.

Three of our machines are missing.

The casualties caused by hostile air raids on the night of the 4th-5th inst. include 80 German prisoners of war, of whom 37 were killed and 43 wounded by bombs dropped by the enemy's aeroplanes.

Sept. 7th, 9.4 p.m.—On the 6th inst. bad weather caused a diminution of the great aerial activity of the previous two days. A certain amount of bombing was carried out during the day, and over 100 bombs were dropped on various targets.

Two enemy machines and one German observation balloon were brought down, and two other hostile machines were driven down out of control.

One of our machines is missing.

Sept. 10th, 9.17 p.m.—On the 9th inst. thick mist greatly hindered aerial operations. Artillery co-operation was carried out when possible, and a few bombs were dropped by day and night on hostile aerodromes.

Three enemy machines were brought down and four driven down out of control.

Five of our machines are missing.

Home Command Communiqués.

Sept. 5th, 12.15 a.m.—Enemy aeroplanes in considerable numbers crossed the South-East Coast shortly before 11 p.m. and dropped bombs at a number of places.

Some of the machines reached the London district, where bombs were dropped shortly before midnight.

No report of casualties or damage has been received as yet.

Sept. 5th, 1 p.m.—Enemy aeroplanes in considerable numbers crossed the South-East Coast over a wide area between 10.31 p.m. and 2 a.m. last night.

The raiders seemed to have travelled singly or in groups of from two to three machines, for which reason it is difficult to estimate their numbers with accuracy, but it is possible that as many as 20 machines took part in the raid.

By 11.20 p.m. it became evident that enemy aeroplanes were approaching London, and at 11.45 the first bombs were dropped in the London district. From this time until about 1 a.m., 40 bombs were dropped in the district.

Bombs were also dropped at several places on the coast.

The total casualties reported so far are:—

Killed, 9; injured, 49.

The material damage is not extensive.

One enemy machine is reported to have been brought down in the sea off Sheerness.

War Office Communiqué.

Sept. 8th.—The G.O.C. the British Forces in East Africa reports:—

On Sept. 6th our aircraft co-operated successfully with the infantry, setting fire to the enemy's abattis and engaging the defenders with machine-gun fire from a height of 700 ft.

The Casualty List.

Reported Sept. 5th.

Killed.—Foster, Sec. Lt. F. J., R.F.C.

Wounded.—Swann, Sec. Lt. W. E., R. Innis. Fus., attd. R.F.C.

Missing.—Bush, Capt. J. S. de L., Som. L.I., attd. R.F.C.
Tambling, Sec. Lt. H. G., R.F.C.
Wigley, Sec. Lt. L., R.F.C.

Previously reported Missing, now reported Wounded and Prisoner in German Hands.—Mitchell, Lt. A. P., M'x R. and R.F.C.

Previously reported Prisoner, now reported Wounded and Prisoner in German Hands.—Robertson, Sec. Lt. G. M., High. L.I. and R.F.C.

Reproduced from "Het Vliegveld."

THE ROYAL DUTCH FLYING CORPS.

1. Res. 2e Lt. Lioni.
2. 2e Lt. Bisschoff.
3. Res. 2e Lt. Balder.
4. 1e Lt. Van Dijk.
5. Res. 1e Lt. Ten Zeldam
6. Henri Wijnmalen.
7. Res. 2e Lt. Noë
8. 1e Lt. Coblijn.
9. 2e Lt. Wijn.
10. 2e Lt. v sp. d. Castendijk.
11. 2e Lt. Duinker.
12. 1e Lt. Coblijn.
13. 1e Lt. v. d. Abeelen.
14. Res. 2e Lt. Drost.
15. 1e Lt. Sneep.
16. 2e Lt. Völker.
17. Res. 1e Lt. v. Wulfften Palthe.
18. Res. 2e Lt. v. Vliet.
19. 1e Lt. Steup.
20. Maj. Walaardt Sacré, Commt. der L. A.
21. Res. 1e Lt. Daendels.
22. Dr. Bendien.
23. 1e Lt. v. Hecking Colen Brander.
24. 1e Lt. Van Heijst.
25. 1e Lt. Plesman.
26. 1e Lt. Versteegh.
27. 1e Lt. Land.
28. Res 1e Lt. Meltzer.
29. Kpt. Simon Thomas.
30. 1e Lt. Adj. Hofstee.
31. 1e Lt. Perk.
32. 1e Lt. Roeper Bosch.
33. Lt. t. Zee Beuninck.
34. 1e Lt. v. Voorthuyzen.
35. Res. 2e Lt. Collette.
36. 2e Lt. v. Weerden Poelman.
37. Res. 2e Lt. Jongbloed.
38. Res. 2e Lt. Faure.

Previously reported Missing, now reported Prisoners in German Hands.—Murray, Lt. D. C. G., R.E. and R.F.C.
Vipond, Lt. F. E., Manch. R. and R.F.C.

Reported Sept. 6th.

Wounded.—Adkin, Sec. Lt. C. W., R.F.C.
Bean, Lt. H. H. W., R.F.C.
Bridgeman, Sec. Lt. O. C., R.F.C.
Mackay, Sec. Lt. A. W., S. Wales Bord., attd. R.F.C.
Australian Force.—Died.—Shapira, Sec. Lt. F. C., Fl. C.

Reported Sept. 7th.

Killed.—Fogarty, Sec. Lt. G. J., R. Ir. R., attd. R.F.C.
Greenhous, Sec. Lt. E. B., R. Sco. Fus., attd. R.F.C.
Macdonald, Capt. A. L., M.C., Black Watch, attd. R.F.C.
Wodehouse, Sec. Lt. F. J. A., D. of Corn. L.I., attd. R.F.C.
Wounded.—Barker, Sec. Lt. F. E., Yeo. and R.F.C.
Beaufort, Capt. J. M., A.S.C., attd. R.F.C.
Dumbell, Sec. Lt. H. C., R.F.A. and R.F.C.
Finch, Sec. Lt. J. B., R.F.C.
MacLean, Sec. Lt. R. S. G., R.F.C.
Missing.—White, Sec. Lt. J. G., Sco. Rif. and R.F.C.
Williams, Sec. Lt. C. P., R.F.C.

Reported Sept. 8th.

Wounded.—Taylor, Sec. Lt. A. L., A.S.C. and R.F.C.
Previously reported Missing, now reported Prisoners in German Hands.—Grosset, Lt. W. E., Cyc. Bn. and R.F.C.
Savory, Sec. Lt. A. J., Yeo. and R.F.C.
Winterbotham, Capt. F. W., Yeo. and R.F.C.
Australian Force.—Wounded.—Bill, Lt. A. G., Fl. C.

Reported Sept. 10th.

Previously reported Missing, now reported Killed.—Blackburn, Lt. H. D., R. Berks R., attd. R.F.C.
Clifton, Sec. Lt. W. G. T., Oxf. and Bucks L.I., attd. R.F.C.
Day, Lt. W. L., Bord. R., attd. R.F.C.
Harris, Sec. Lt. P. G., R. Welsh Fus., attd. R.F.C.
Wounded.—Jones, Sec. Lt. H. A., Wilts R., attd. R.F.C.
Missing, believed Killed.—Bamford, Sec. Lt. J. L., R.F.C.
Previously reported Missing, believed Killed, now reported Died of Wounds as a Prisoner in German Hands.—Adams, Sec. Lt. V. H., R.F.C.
Previously reported Prisoner, now reported Wounded and Prisoner in German Hands.—Bacon, Sec. Lt. L. G., R.F.C.
Previously reported Missing, now reported Prisoner in Bulgarian Hands.—O'Dwyer, Capt. J. E. A., Sher. For., attd. R.F.C.
Previously reported Missing, now reported Prisoners in German Hands.—Cock, Capt. G. H., M.C., R.F.C.
Griffith, Sec. Lt. J. C., R.F.C.
Harris, Sec. Lt. H., R.F.C.
Lewis, Sec. Lt. H. M., Welsh R., attd. R.F.C.
Mathew, Lt. C. G., R.F.C.
Palmer, Sec. Lt. G. H., R.F.C.
Strickland, Sec. Lt. W. A., M'x R., attd. R.F.C.
Sturgess, Sec. Lt. T. M., R.F.C.
Trattles, Sec. Lt. R., R.F.C.

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Casualties among N.C.O.'s and Men. The dates are those of the official list.

Killed.

August 27th.—R.F.C.—Lovelock 43584 2nd Cl. Air Mech. A. A. G. (Portsmouth).
August 30th.—Brook 42822 2nd Cl. Air Mech. L. E. (Dewsbury); Lawson 10305 Cpl. B. (Chingford, E.); Moorcroft 13076 1st Cl. Air Mech. F. J. (Epsom).

Died.

August 27th.—R.F.C.—Colley 28824 2nd Cl. Air Mech. J. F. (Helperby).

Wounded.

August 27th.—R.F.C.—Cusens 65091 2nd Cl. Air Mech. F. D. (Exmouth); Sharp 43575 2nd Cl. Air Mech. S. T. (Paddington, W.).
August 29th.—Morse 62935 2nd Cl. Air Mech. B. T. (Bury Port).
August 30th.—Olah 18395 Actg. Sgt. E. H. (King's Cross, N.). Edsall 12435 2nd Class Air Mechanic P. V. K. (Wealdstone); Else 87595 2nd Cl. Air Mech. H. (Mansfield); Parkin 67976 2nd Cl. Air Mech. R. (Cardiff); Taylor 65074 2nd Cl. Air Mech. W. R. (Stoke Newington, N.); Watson 77615 2nd Cl. Air Mech. A. C. (Melksham); Webley 43403 2nd Cl. Air Mech. D. A. (Cheltenham).
R.F.C. attd. R.G.A.—Taylor 9559 1st Cl. Air Mech. H. (Manchester).
August 31st.—Guile 18266 2nd Cl. Air Mech. W. J. S. (Bermondsey, S.E.); Haston 7126 1st Cl. Air Mech. T. (Horwich).
Previously Missing, now reported Died as Prisoners of War in German Hands.
August 29th.—R.F.C.—Dunn 6396 Sgt. R. (Workington).

Australian Imperial Force.
Accidentally Killed.

August 27th.—A.F.C.—Larkin 970 S. B.

PERSONAL NOTICES.

Deaths.

ASTON.—An inquest was held at Ealing on Sept 8th into the circumstances attending the death of Sec. Lt. Leonard Hugh Aston, R.F.C., attd. to the School of Instruction, Acton. He was 28 years of age, and was killed while flying at Hanger Hill on Sept. 6th. A witness stated that Mr. Aston rose too high in too short a time; he lost flying speed and had a side-slip. The machine "banked" and finally nose-dived to earth. It came down vertically, the engine being full on instead of being turned off. Mr. Aston must have lost his head. A similar view was expressed by a civilian instructor. Dr. Ruck said the officer was brought to Ealing Hospital. The upper part of the spine was dislocated and the base of the skull fractured; there were also other injuries. Death must have been instantaneous. The jury returned a verdict of accidental death.

BURLTON.—Capt. Arthur Vivian Burlton, R.F.C. (killed at Catterick in a flying accident on August 30th), aged 22, was the only son of Lt.-Col. A. H. Burlton, late R.A.M.C., and of Mrs. Burlton. After serving for some time in the Army Service Corps he was gazetted to the Royal Flying Corps in 1916, and was promoted captain in June of the present year.

CLARKE.—Capt. Sydney Herbert Clarke, M.C., Wilts Regt., attd. R.F.C., who died of wounds on Sept. 2nd in hospital abroad, was the eldest surviving son of Mr. and Mrs. C. H. Clarke, of Langsmead, Pyrford, Surrey. He was 20 years of age.

CLEGG.—Lt. Robert Leslie Clegg, Lanc. Fus. and R.F.C., only son of Mr. and Mrs. Robert J. Clegg, of Holbeck, Windermere, was killed on Sept. 3rd. Born in 1887, he was educated at Mulgrave Castle by the Rev. the Marquess of Normanby, at Uppingham, and later in France and Germany. At the outbreak of war he was in Ceylon, and immediately came home, enlisting in the Royal Engineers as a dispatch rider. In Oct., 1914, he was gazetted to the 4th Lanc. Fus., and joined the 9th battalion in Gallipoli on Sept. 8th, 1915, where for some time he commanded a company. Soon after the evacuation he transferred to the R.F.C. and served in Egypt, latterly being a flying instructor until invalided home last May. He left for the front in August, and was killed while flying over the German lines.

CURTIS.—Sec. Lt. Henry Neville Curtis, R.F.C., who was previously reported missing, now reported killed in action while flying over the German lines, was the only son of W. H. and Mrs. Curtis, West Street, Oundle. He was 18½ years of age.

DOWNING.—Lt. George Guy Barry Downing, R.F.C., was accidentally killed on Sept. 4th whilst flying on active service in Scotland. He was 23 years of age, and had transferred to that Corps from the Welch Regt. after service and being wounded in France.

DUNVILLE.—A fatal aeroplane accident is reported from Grantham on Sept. 6th, the victim being Flt. Sgt. George Dunville, R.F.C., age 24, married, whose home is in Belfast.

EDMUNDS.—A young flying officer from Johannesburg, Sec. Lt. V. S. Edmunds, R.F.C., aged 19, was killed while flying at Shoreham (Sussex), on Sept. 6th. It is believed to have been his first "solo" trip, and he had been up but a little while when the machine crashed down, falling on the bed of the River Adur, the tide being low at the time.

An inquest was held at Shoreham on Sept. 7th on his body. A witness expressed the opinion that the aviator put on the full left rudder without a corresponding bank, with the result that the right wing dropped at the same time. He then pulled the nose up and the machine lost flying speed. It was an error of judgment through lack of practical flying experience. A verdict of accidental death was returned.

GRANDIN.—Sec. Lt. Richard John Grandin, A.S.C., attd. R.F.C., late Capt. Royal Militia of the Island of Jersey, and Temp. Capt. A.S.C., who was reported "missing" on May 18th, 1917, now officially reported killed on that date, was the husband of Marguerite Grandin (née Pitcher, 58, Anson Road, N., and only son of J. E. Grandin, Esq., St. Heliers, Jersey. He was 24 years of age.

Mr. Grandin was educated at Victoria College, which he left at the age of 15 to join the training ship "Conway." As he failed in the last colour test, he was in the ship only six months, and then completed his education at the Lycée of St. Breux, in France. He obtained a commission in the Jersey Militia in December, 1909, and commanded a company for over four years. Seeing no prospect of service oversea, he applied, in November, 1914, for a temporary commission as lieutenant in the A.S.C., which he obtained, and was gazetted temporary captain in April, 1915. He left for Egypt at the end of the year.

He obtained his regular commission in June, 1916 (antedated Sept. 28th, 1915), and after serving in Egypt 15 months, exchanged into the R.F.C. in November, 1916. He came home to complete his training, left for another front last April, and was acting flight commander when he was reported "missing" on May 18th, being reported killed on that date on Sept 8th. He was a fine sportsman, and an experienced yachtsman.

HARGREAVES.—Sec. Lt. C. A. Hargreaves, R.F.C., whose death has occurred from wounds received in action, was the younger son of Mr. A. and Mrs. Hargreaves, of Warham Road, Harringay, N. Last month he destroyed a German aeroplane, and two days later he was severely wounded, but he brought his machine and observer back safely.

HAYES.—Lt. Reginald Hayes, R.F.C., second son of Mr. and Mrs. Thomas Hayes, of Sudbrooke Road, Wanstead Common, was killed while over the German lines, at the age of 19. He entered the Army with a commission in January, 1915, and for two years was attd. to the S. Lanc. Regt. He was wounded last November, and in January returned to the front, and three months later was transferred to the R.F.C. He was in many air fights, and his death occurred on his first flight after his return from leave.

HINCHLIFF.—Sec. Lt. Cyril Stanley Hinchliff, R.F.C., whose home is at Littlehampton, was flying over a Lincolnshire rural district on Sept. 5th when he apparently lost control over his aeroplane, which dived to earth. When assistance arrived it was found that the pilot had been so severely injured that death was probably instantaneous.

HOLMAN.—Lt. Cecil Graham Holman, King's Own Scottish Borderers, attd. R.F.C. (died of wounds received in action on Sept. 5th), was the only son of William Gilbert and Gertrude Marie Holman, of Cromwell Crescent, Earl's Court. Born in March, 1897, he was educated at the Frinton College, Philberts, Holyport, and Rossall School. He enlisted in the Public Schools Battalion in Sept., 1914, and received a temporary commission in the Yorkshire Regt. Later he was gazetted second lieutenant in the King's Own Scottish Borderers. After a year's service he joined the R.F.C., acting as observer for some months in France, and becoming a flying officer in April, 1917.

HUNT.—Sec. Lt. Geoffrey Albert Hunt, R.F.C. (died at Lincoln on Sept. 6th as the result of a flying accident two days previously), aged 18, was the only son of Mr. and Mrs. Albert Hunt, of Rothwick Road, Golder's Green, now at 107, Highbury New Park, N.5. He was gazetted in June of the present year.

KINKEAD.—A verdict of "Accidental Death" was returned at an inquest at Worthing on Sept. 4th on the body of Sec. Lt. Thompson Calder Kinkead, R.F.C., who was killed while making his second solo flight on the previous day. Mr. Kinkead, who was stated to have exhibited splendid control over the machine, came down in a spiral from a height of 2,000 ft. to 3,000 ft., next made a series of steep vertical banks for another thousand feet, and then straightened out again, apparently with the view of returning home. Unfortunately the engine failed to respond immediately, having become cold during the long descent, and at a height of 250 ft. the pilot appeared to stall the machine for the purpose of reaching a favourable landing, with the result that the machine lost its flying power and nose-dived. Mr. Kinkead was the elder son of the late Samuel Kinkead and Mrs. Kinkead, of Johannesburg. He was 24 years of age.

MATHESON.—Lt. A. P. Matheson, R.F.C. (missing, now reported killed in action on July 13th), was the only surviving son of Mrs. Alec. Matheson, of Ardarun, Littlehampton. Her other two sons have fallen in action, Capt. Ian Matheson, Seaforth Highrs., aged 22, having been killed in May last, and Lt. Roderick Kyrle Matheson, R.W. Kent Regt., wounded on Sept. 3rd, 1916, having died a prisoner of war five days later. Her son-in-law, Lt. Patrick Gould, King's Royal Rifle Corps, has also been killed in action. After serving since Dec., 1915, in the Army Service Corps, Lt. A. P. (Val) Matheson became a flying officer early in the present year.

O'BEIRNE.—Lt. Arthur James Lewis O'Beirne, Yeo., attd. R.F.C., was the only surviving son of Major O'Beirne (late R. War. Regt.), and Mrs. O'Beirne, of Astrop Grange, near Banbury, and Augherea, Co. Longford, Ireland. He was educated at Summerfields, Oxford, Radley College, where he was in the first eleven, and at Exeter College, Oxford, where he was whip to the college beagles. When war broke out he had just arrived in British East Africa, and immediately enlisted as a trooper in the East African Mounted Rifles. After nine months' fighting he was invalided home, and was then offered a commission in the Oxford Yeomanry. In December, 1916, he joined the R.F.C., and after obtaining his pilot's certificate was for some time in England. He went to the front last July, and died of wounds received in action on the 28th of that month. His only brother, Lt. John I. M. O'Beirne, R. War. Regt., attd. R.F.C., was killed at the front last April.

ROBERTS.—Lt. Arthur Doricourt Roberts, M.C., Scottish Rifles and R.F.C. (killed on August 31st when flying), aged 22, was the youngest son of the late David Thomas Roberts, C.S.I., of the Indian Civil Service, and of Mrs. Roberts, of Granville Cottage, Byfleet. Gazetted to the Scottish Rifles in November, 1914, he became lieutenant twelve months later, and was awarded the Military Cross for conspicuous gallantry in action. The official account said: "He assumed command of the assaulting forces of the battalion, reorganised and consolidated the position. He displayed great courage and initiative throughout." Mr. Roberts entered the Royal Flying Corps in September, 1916, and was a qualified observer.

SANDYS.—Lt. William Edwyn Sandys, R.F.C., only son of Mr. and Mrs. E. P. Sandys, of Calcutta, India, and Blackheath, S.E., who has been killed in action, was born in 1890. Educated first at Bath, and afterwards at St. Paul's College, where he won his colours for rowing and swimming, and from where he matriculated, he was for some years in America and Canada. He was in Lillooet, B.C., at the outbreak of war, and immediately joined up in the 1st Canadian Contingent, Lord Strathcona's Horse (R.C.). When he left Lillooet he was presented with a gold watch in recognition of his recruiting work. Coming to England, he obtained his commission in the Army Service Corps, and left for Egypt with his brother-in-law, Sec. Lt. R. J. Grandin, who has fallen in action. Transferring to the R.F.C., he acted as flight commander in Scotland and England. He left for the front in August last, and was killed in action on Sept. 5th. Lt. Sandys was a fine all-round sportsman, and had travelled extensively. He married in September, 1915, Elsie, daughter of Mrs. and the late G. A. Pitcher, of 58, Anson Road, N.7.

SAYER.—Sec. Lt. James Herbert Sayer, R.F.C., who was reported missing on April 3rd and is now officially presumed to have been killed on that date whilst engaged on a photographic reconnaissance, aged 19, was the elder son of Mr. and Mrs. C. J. Sayer, of 69, Marchmont Road, Wallington. He was educated at the Whitgift Grammar School, Croydon, where he was a sergeant in the O.T.C. He was also captain of the first fifteen and of the school shooting eight. He left the school in June, 1916, to take a commission in the R.F.C., and went to the front in the beginning of last November, having for some time previously acted as an assistant instructor. His commanding officer wrote:—"Your son was a first-class pilot and could always be depended on to carry out his job thoroughly well. He is a great loss to the squadron. . . ."

SLOANE.—Sec. Air Mech. William Douglas Sloane, A.F.C., who was accidentally killed while flying on August 21st, was the youngest son of James and Amy Sloane, Bernarra, Mulwala, N.S.W. He was 27 years of age.

VINOGRADOFF.—While flying in Wiltshire on Sept. 6th Cadet Vinogradoff, Russian Army, attd. R.F.C., was killed.

WODEHOUSE.—Sec. Lt. John Francis Ashburnham Wodehouse, Duke of Cornwall's Light Infantry and R.F.C., killed on Aug. 26th, aged 20, was the only son of the late Francis John Wodehouse, and grandson of the late Rev. Algernon Wodehouse, M.A., rector of Easton, Hants. He was educated at Ardingly College, Hayward's Heath, and while there joined the O.T.C. He obtained his commission in the D.C.L.I. in 1915, and was wounded last year. After returning to the front he joined the R.F.C. as an artillery observation officer, and, as such, met his death. General Sir Josceline Wodehouse, G.C.B., has received a letter from the Rev. W. Kerr, saying:—" . . . others will tell you of the valuable work he has done; we are mourning the loss of a brave comrade."

Engagements.

LITHGOW—BALFOUR.—The marriage arranged between Major Ernest Lithgow, R.A.M.C. and R.F.C., and Miss Doris Balfour will take place at the Parish Church, Tetbury, on Tuesday, Oct. 2nd, at 11.30. All friends will be welcome at the church.

MIDDLETON—SHORT.—The engagement is announced between Capt. John Leam Middleton, R.F.C., elder son of the late Town Clerk of Chesterfield, and Margaret, elder daughter of the late Alderman S. E. Short, J.P., and of Mrs. Short, of Brampton Manor, Chesterfield.

Marriages.

ADAMSON—THORNE.—In London, on Sept. 5th, Sec. Lt. W. Adamson, R.F.A., attd. R.F.C., was married to Emily fourth daughter of Mr. Will Thorne, M.P.

DIXON—ANDREWS.—On Sept. 4th, at Binbrook, Lincoln, Sec. Lieut. Noël Parker Dixon, R.F.C., son of W. B. Dixon, Esq., and Mrs. Dixon, Christchurch, New Zealand, was married to Dorothy Kathleen, only daughter of the late Rev. W. and Mrs. Andrews, of Claxby Rectory, Lincoln.

LINE—DIMMOCK.—The marriage arranged between Capt. James Line, R.F.C., son of Mr. and Mrs. C. A. Line, Edgbaston, Birmingham, and Dorothy Beatrice Gertrude, second daughter of Lt.-Col. and Mrs. H. P. Dimmock, 23, Homefield Road, Wimbledon, S.W., took place on Sept. 8th at St. Mary's Church, Wimbledon.

RUSSELL—KILLICK.—On the 5th inst., at S. Paul's Withnell, Bernard Parvish Russell, R.F.C., fourth son of the late Canon Russell, Vicar of Todmorden, was married to Harriet Evelyn, third daughter of W. Henry Killick, J.P., Withnell House, Chorley, by the Rev. W. Russell, assisted by the Rev. E. J. Williams and the Rev. G. O. Redman.

TOD—CURLING BATES.—On Sept. 5th, at Christ Church, Gipsy Hill, Norwood, Sec. Lt. Malcolm Tod, Black Watch, R.F.C., was married to Margaret Evelyn May, only daughter of

the late Dr. Curling Bates and Mrs. Curling Bates, of 62a, Central Hill, Norwood, by the Rev. Eustace Bateman.

Births.

CHESHIRE.—On Sept. 6th, at Chester, to Primrose, wife of Capt. G. C. Cheshire, R.F.C., B.C.L., Fellow of Exeter College, Oxford—a son.

GILBERT.—On Sept. 8th., at 23, Grange Park, Ealing, the wife (née Lepper) of Lieut. H. J. Gilbert, R.F.C., of a son.

MACAULAY.—On August 17th, at Bulkley, Alexandria, Egypt, Katharine, the wife of Captain T. C Macaulay, M.C., R.A., and R.F.C., of a daughter.

ROCKINGHAM GILL.—On Sept. 9th, 1917, to Christina, and Captain Rockingham Gill, R.G.A. and R.F.C., a daughter.

The following names appear in a list of British officers, prisoners of war, who are interned in Switzerland, and who have been passed for repatriation, which appeared in the "Morning Post," on Sept. 6th.—

Capt. Wilson, R.F.C.
Capt. Goode, R.F.C.
Sec. Lt. Grimwade, R.F.C.
Sec. Lt. Selby, R.F.C.

The above left Switzerland for England on Sept. 8th. A party which left on Sept. 11th includes:—

Capt. Darley, R.F.C.
Capt. Hill, R.F.C.
Sec. Lt. Macaskie, R.F.C.

* * *

The parents of Second Lieut. G. A .H. Parkes, R.F.C., of Upper Staplehall, Northfield, Birmingham, who was reported missing on July 15th last, have now received word from him that he is wounded and a prisoner in German hands at Johannisthal, Stettin.

Recruits Wanted for the R.F.C.

The Secretary of the War Office makes the following announcement:—

Recent reports from the battle front illustrate the extent to which the Allies maintain superiority in the air, thanks to the bravery of our aviators and the skilled organisation of the work of construction and repair at home and in the field.

To keep this superiority further great efforts are needed, and the Royal Flying Corps is seeking men, skilled and unskilled, for its various branches. Men over age are not excluded from the corps, which offers very interesting employment at special rates of pay.

Intending applicants should communicate with the nearest recruiting officer for particulars.

[Intending applicants should note that special recruiting offices for the Royal Flying Corps exist at the Regent Street Polytechnic, London, W., and of South Farnborough, Hants, and, in the event of difficulty locally, prospective recruits will do well to apply at one of these main depôts.—Ed.]

FRANCE.

Official Communiqués.

Sept. 4th.—Last night German machines dropped bombs in the region of Dunkirk and Calais. At the latter point there were several killed and wounded.

The region north of Nancy and the neighbourhood of Lunéville were also visited by enemy aeroplanes. The material damage done was insignificant. There were no casualties.

Our bombing machines dropped numerous projectiles on different aerodromes, railway stations, and bivouacs in the enemy zone north of Soissons.

Another expedition resulted in two fires breaking out in the railway station of Fresnoy-le-Grand (south-south-east of Le Catelet).

Moreover, we bombarded the railway stations of Roulers and Lichtervelde, in Belgium, the aerodromes of Habsheim, Frescati, and Colmar, and the railway stations of Conflans, Cambrai, Thionville, Metz, Woippy, where a violent fire broke out, etc.

During these expeditions 15,500 kilogrammes (about 15 tons) of projectiles were dropped by our squadrons on the enemy objectives, which sustained important damage.

Yesterday our chaser aeroplanes brought down 13 German machines, most of which were destroyed.

Army of the Orient.—On the left bank of the Struma British patrols made some prisoners. British aviators bombarded the enemy camps north of Demirhissar.

Sept. 5th.—Last night German aeroplanes again bombarded Red Cross stations in rear of the Verdun front. It is reported that some of our men were killed and wounded.

A large number of bombs were also dropped on Bar-le-Duc. There were some casualties among the civil population.

On Sept. 4th, five German aeroplanes were brought down by our pilots, and five other machines fell into their lines seriously damaged. An eleventh German aeroplane was brought down by the fire of our machine-guns.

As a reprisal for the bombardment carried out by the enemy against our Red Cross stations two of our aeroplanes dropped bombs on Trèves last night.

Our bombing aeroplanes, moreover, made a large number of raids against the railway stations of Roulers and Pithem (east-north-east of Roulers), the aerodromes of Ghistelles, the ammunition dumps of Thourout, where a violent fire broke out, the barracks of Lahr (Baden), the aerodrome of Schlettstadt (Alsace), the factories of Hagondange (north of Metz), etc.

Sept. 6th.—Some bombs were dropped on Dunkirk, and some people among the civilian population were wounded.

Our air squadrons last night bombarded the aerodrome of Marville (south-east of Montmédy), the railway station of Challerange (south of Vouziers), and many enemy bivouacs.

Sept. 7th.—Three German aeroplanes were brought down on Sept. 5th and 6th as the result of air fights. Twelve other machines were forced to the ground out of control.

During the night of Sept. 5th-6th our squadrons dropped 1,100 kilogrammes (over a ton) of bombs on the railway station of Thionville (north of Metz) and 1,400 kilogrammes (1 2/5 tons) on that of Woippy (near Metz).

Sept. 10th.—On the 8th and 9th inst. five German machines were brought down in aerial fighting.

In recent weeks our pilots have continued their exploits and obtained results. Capt. Guynemer has raised to 50 the number of German machines he has destroyed. Sec. Lieut. Nungesser has gained his 30th victory, and Capt. Heurteaux his 20th, and Second Lieuts Madon, Ortoli, Lufbery, and Sergts. Fonck and Jailler have accounted for their 10th adversaries.

* * *

Reuter's correspondent with the French Army reported on Sept. 6th:—

Last night the Germans made another air attack on the military hospital at Vadelaincourt (Meuse), aiming especially at a shed which was occupied by severely wounded cases from the Verdun front. The attack began at 10.30 p.m. and was kept up until 3 a.m., the aeroplanes flying over the sheds and dropping bombs every 20 or 30 minutes.

Nineteen inmates of the hospital and dependent buildings were killed, and 26 wounded. During the past month 100 persons, including several women, have been killed or wounded by the German air raiders in this hospital alone.

* * *

The special correspondent of the "Temps" (Paris, Sept. 7th) gives some details of the bombardments of Calais by enemy aviators.

On Sept. 2nd an unknown number of aeroplanes dropped some hundreds of objects resembling "Madeleines," covered with a substance resembling chocolate icing, which the chemists are analysing. On Sept. 3rd another lot of aeroplanes threw bombs of a kind hitherto unknown, which did no damage worth mentioning. In a certain inland town which the squadron bombed some hundred German prisoners were being moved, and an enemy aviator, thinking they were British troops on the march, descended to a height of 300 ft. and threw three bombs, killing 43 of the prisoners and severely wounding 47.

One enemy aeroplane was brought down at Calais and two others on Sept. 4th at Dunkirk.

GERMANY.

Official Communiqués.

Sept 4th.—On the night of Sept. 2nd-3rd our aviators dropped bombs on Calais and Dunkirk. The fires caused were visible throughout the whole day.

Yesterday 19 enemy aviators and two captive balloons were shot down. Baron von Richthofen achieved his 61st aerial victory, whilst Lt. Müller, who, on account of his services, was recently promoted from a vice-sergeant, brought down his 27th opponent.

Yesterday Dover and last night Chatham, Sheerness, and Ramsgate, were attacked with bombs by our aeroplanes.

Sept. 5th.—Our aviators made a successful night attack on London.

By day and by night there has been very vigorous aerial activity and numerous bombing enterprises. Far distant objectives were successfully attacked with bombs—Dover, Boulogne, and Calais.

Twenty-two enemy aeroplanes were shot down. Lt. Voss brought down his 39th opponent.

Sept. 6th.—Fourteen enemy aviators and one captive balloon were shot down yesterday over the Continent. Lt. Voss achieved his 40th and 41st aerial victory.

During the night of Sept. 4th-5th our aviators attacked London, Southend, and Margate. The incendiary effect of the bombs dropped was observed. One of our aeroplanes has not returned.

Front of German Crown Prince.—The artillery battle before Verdun continued yesterday. Valuable services were performed by our aviators.

Sept. 7th.—Nine enemy aeroplanes were brought down in aerial engagements and five further machines by anti-aircraft guns.

Sept. 10th.—In the month of August 64 of our aeroplanes which went out against the enemy have not returned. Four of our captive balloons were shot down. In the same period the losses of our enemies amount to 37 captive balloons and at least 295 aeroplanes, of which 126 were brought down in flames behind our lines and 169 on the other side of the enemy lines.

[The 64 which "have not returned" are, obviously, those which fell in the territory held by the Allies, those which were shot down in "Hunland" certainly "returned," albeit not precisely in the manner desired.—Ed.]

RUSSIA.

Official Communiqués.

Sept. 6th.—On Sept. 1st-2nd our aviators bombarded the railway station of Goloby (20 miles S.E. of Kovel) and depots in the region of the Kizel Railway, dropping 24 poods (about 865 lbs) of bombs. On Sept. 2nd, 22 poods (about 793 lbs.) of bombs were dropped on the villages of Eleonorowka and Kluvnnyek (?Kluwince), south-west of Grzymalov (midway between Sereth and Zbrucz Rivers).

In the region of Piatna our artillery brought down an enemy aeroplane, the occupants of which were made prisoners.

Sept. 7th.—On the night of Sept. 5th-6th our aviators carried out a flight over the railway station at Baranovitchi, where eight poods (about 290 lbs.) of bombs were dropped.

In the region south-east of Lake Miadziol (65 miles south of Dvinsk) our artillery brought down an enemy aeroplane, which fell in our lines near the village of Boyary. The enemy aviators were taken prisoners.

On the evening of Sept. 5th-6th a squadron of enemy aeroplanes dropped bombs in the region of the railway station of Zamirie (on the Minsk-Baranovitchi line).

Enemy Zeppelins appeared on Sept. 5th to the south of Pernau (north-east end of the Gulf of Riga). Bombs dropped by them near Hainash (about 30 miles farther south) were without effect.

Sept. 8th.—In the Jacobstadt region (on the left bank of the Dvina, about 20 miles south-east of Kokenhusen), enemy aeroplanes have been increasingly active. Bombs were dropped on the town of Jacobstadt. The senior physician of an ambulance corps was killed, and a nurse and a student were wounded.

In the course of Sept. 7th 23 enemy aeroplanes and battleplanes carried out a series of flights and reconnaissances over Tserel (south-western point of Oesel Island, Gulf of Riga), Arensburg (chief town of Oesel), and the region of Kuivast (on Moon Island).

In the Gulf of Riga five enemy machines attacked without success our torpedo-boat patrols. In an aerial battle near Arensburg our naval aviators brought down an enemy battleplane. The machine was destroyed by fire and the aviators perished.

Our aviators dropped bombs on the small town of Telekhany (30 miles north of Pinsk, in the centre), on the Ogin Canal, where the staff of a German regiment is stationed. Successful hits were observed.

Sept. 9th.—Our aerial reconnaissances reveal considerable animation at the advanced railway stations of the enemy in the Jacobstadt and Dvinsk regions.

Our aeroplanes dropped bombs on the enemy depôts in the village of Rodze (north-west of Postavy), south of Dvinsk, and also attacked the village of Ozaritchi (20 miles north-west of Pinsk) on the Ogin Canal, where the quarters of a German regiment were established.

Roumanian Front.—On Sept. 7th a squadron of enemy aeroplanes made a raid on the station of Ajud and dropped a number of bombs.

Sept. 10th.—On Sept. 8th, after midnight, enemy hydro-aeroplanes dropped 40 bombs on the batteries at Tserel (southern extremity of Oesel Island, Gulf of Riga), without effect.

In the Gulf of Riga a group of our torpedo-boats was twice attacked by 16 enemy machines, which were met by the concentrated fire of our torpedo-boats. Forty bombs were dropped without result.

An enemy Zeppelin was observed making a reconnaissance to the west of the Island of Oesel, direction of Segevold.

In the region to the south-east of the small town of Krevo our artillery brought down an enemy aeroplane, which fell near the village of Mekulevstchi The German aviators were killed.

Yesterday, in the region of Luninetz railway station, an enemy aeroplane dropped several bombs in the neighbourhood of the hospital. One of the military patients was killed, and ten patients, three assistants, and one small boy were wounded.

AUSTRIA.

Official Communiqués.

Sept. 7th.—Enemy aviators are now making attacks on the open town of Trieste daily.

Sept. 8th.—Trieste has again been bombed by aviators.

Sept. 9th.—On Sept. 7th, as a reprisal for the repeated attacks of enemy aviators on the open town of Trieste, our seaplanes, on the night of the 7th, copiously and most successfully dropped bombs on the naval arsenal and military establishments of Venice. Numerous hits were reliably observed. All our aeroplanes returned.

ITALY.

Official Communiqués.

Sept. 4th.—On the Julian front there has been considerable activity on the part of our aeroplanes.

Last night in favourable atmospheric conditions 30 of our aeroplanes flew over Pola and bombarded the military works of this naval port and the enemy fleet at anchor in the harbour and in the Fasana Canal (between the mainland and the islands of San Nicolo and Brioni, north of Pola). Nine tons of bombs were dropped on the targets, causing destruction and big conflagrations. Our machines, though attacked by seaplanes and shelled by anti-aircraft batteries, returned safely to their bases.

On the night of the 1st-2nd instant enemy aircraft carried out a bombing raid on some locality in the plain between the Lower Isonzo and the Tagliamento, causing casualties among the civil population and soldiers in hospitals.

Sept. 5th.—Yesterday the battle on the Julian front was renewed violently.

Two hundred and sixty-one of our aeroplanes participated in the battle, bombarding the enemy's troops and communication lines.

On the night of the 4th-5th inst. our air fleet renewed the bombardment of Pola with effective results and returned safely to its base.

Sept. 6th.—In the Bazza Valley (Tolmino) (Upper Isonzo), east of Chiapovano Valley, in the Voiscizza region (1¾ miles south-east of Kostanjevica), and on the reverse of Hermada enemy batteries and troops were very effectively bombarded by our aviators.

Sept. 7th.—Our aeroplanes repeatedly destroyed or threw into confusion enemy batteries of the Panovizza Wood and Ternova Forest (respectively east and north-east of Gorizia), and in the communication lines on the Carso.

Sept. 10th.—Our aeroplanes bombarded enemy batteries in the Ternova Forest (north-east of Gorizia). The enemy attacked them with intense anti-aircraft fire.

* * *

The "Agenzia Stephano" (Rome, Sept. 10th.) reports a dramatic duel over Bellona, between an Austrian Albatros and an Italian Nieuport, piloted by Sergt.-Aviator Dellaro

The latter's machine-gun became jammed, but Dellaro, instead of taking advantage of the superior speed of his machine to withdraw from the fight, deliberately charged the Austrian machine, both coming down from a height of 9,000 feet. The Italian and Austrian aviators were buried together with military honours.

[It seems more probable that the collision was purely accidental.—Ed.]

* * *

The "Corriere della Sera" published on 30th ult. a long account of the great part taken in the recent offensive by the Aero Corps. Some extracts from this article are of distinct interest, as is the fact that no mention occurs in it of any hurt Caproni machines. I therefore give the following:—

Yesterday, too, the violent attacks of our infantry were greatly helped by our aerial forces, which have become stronger than those of the enemy. . . .

On the 19th inst. 85 Capronis went off with a load of explosives to chastise the lines behind the enemy front from Tolmino to the sea. On the 20th, during our infantry attacks, another 85 Capronis deposed tons of explosives along the Chiapovano Valley. . . . On the 21st, 78 machines carried on the bombing with evident destruction of waggons and columns of the enemy in flight. On the 22nd another 45 Capronis were out planting bombs on the enemy, who hastily removed his second line, etc. to . . . and his first to . . .

Forty-four machines kept up the bombing on 23rd inst.; 48 on 24th, and the same number on 25th.

On the succeeding days the aerial action never stopped, and the enemy's retreating movements, as well as his efforts to change or strengthen his position, were harassed by the constant brave and untiring work of our Capronis. . . .

As well as destroying, the aerial activity set out to nip in the bud any attempts at counter-offensive tactics.

On the 9th the Caproni squadrons, it must be remembered, had braved the fire of the 300 A.A. cannons defending Pola. . . . Also, that in certain actions in the dark over the Adriatic, no less than 240 men were up at the same time. Some of the pilots were on service for as much as seven hours at a stretch. Over the land actions, having destroyed the wire entanglements, the

Capronis—safe and terrible—preceded our infantry attacks, making straight the way and confounding the enemy's tactics.

Continuing its account of the air work of the August offensive, the "Corriere della Sera" says that during the months of preparation practically no recognition (reconnaissance) work was able to be accomplished by the Austrian aeroplanes owing to the decided superiority of the Italians, and that everything that happened during the battle proves that this enforced blindness was a fact.

Mention is made of an Austrian shrieking-splinter-and-black-smoke bomb, and also of the success of the smoke signalling used by the Italians.

* * *

The Minister of Munitions visited the Caproni works early in the first week of September, assisted at the tests of one of the big triplanes, and had a trip over Milan on another, the evolutions of which caused much satisfaction. The looping of these big machines is very dignified.

* * *

I fancy more will be heard of our Gabardinis in England now that so many neo-pilots from that country are in training, at C——, on those machines.

* * *

According to the daily papers a new type of Forlanini dirigible has just completed its trial trip from the works at Milan to Rome in full war kit, and eight hours at over 4,000 metres altitude.

According to one Milan paper the vessel can navigate at over 6,000 metres, has a radius of action of 1,000 kilometres, and climbs faster than any heavier-than-air machine.

In battle-rig she is said to lift from two to three tons (*tonnellate*) of explosives, and is expected therefore to be capable of doing valuable service. It was, of course, known that a great thing was incubating at the "Leonardo da Vinci" works. One hopes the new destroyer may exceed all expectations.

* * *

Gabriele d'Annunzio. Italy's poet-patriot, who has just rejoined the colours on recovering from wounds sustained in an aerial trip over Pola, is a man for whom death has no terrors. Years ago he prepared for it by building himself a tomb in the Apennines, by the springs of the Pescara. The poet has twice been wounded in his country's service, but perhaps his greatest work was done when his fiery eloquence stirred his countrymen to the freeing of the Trentino. Austria recognised his part in bringing Italy into the war by offering £800 for his capture.

* * *

Several bombs were dropped by Austrian aviators on Venice on the night of Sept. 4th-5th, but there were no casualties or damage.—T. S. Harvey.

BELGIUM.

Official Communiqué.

Sept. 4th.—Some of our aviators, flying at a low altitude, fired with their machine-guns on the enemy's trenches north of Dixmude, as well as on a motor transport column drawn up near Beerst.

TURKEY.

Official Communiqués.

Sept. 6th.—On the night of Sept. 3rd our seaplanes dropped bombs on the enemy aerodrome at Imbros. In spite of violent artillery fire all our machines returned undamaged.

Sept. 8th.—Our aerial squadrons successfully dropped bombs on the Port of Mytilene, as well as on an aerodrome situated on that island.

SWEDEN.

It was reported from Stockholm on Sept. 9th that plans are in preparation for the establishment of a regular aerial traffic to the interior of Sweden and abroad. The Russian Government has promised its assistance in the matter of obtaining petroleum and oil.

The Swedish Chamber of Commerce in London is projecting aerial communication between Sweden and England, and the German Government has been asked to give its authorisation for communication between Sweden and Sassnitz. It is, of course, understood that these projects will not come into force until after the war.

CUBA.

Colonel Manuel Coronado, member of the Cuban Senate, has announced the organisation of an aviation unit which will be offered to France with complete equipment, states Reuter's Havana correspondent.

Though other means of co-operation with the Allies have assumed shape since Cuba's declaration of war against Germany on April 8th last, it is probable that the Escadrille Cubaine, as the flying unit will be called, will be the first body of fighting men from Cuba to serve on French soil.

THE NAVY LEAGUE AND THE AIR.

At a meeting of the Executive Committee of the Navy League held on the 6th inst. at the Central Offices of the Organisation, 13, Victoria Street, S.W.1., Colonel Wilfrid Ashley, M.P., presiding, the following resolutions were unanimously adopted:—

1. That the achievement of such supremacy in the ocean of the air as the Navy enjoys on the surface of the sea should be an essential feature of British national policy.
2. That the command of the air is of vital importance to our future existence as a maritime Power and as a united Empire.
3. That, notwithstanding the experience of the war, it is still unfortunately the fact that the dominant part which air power plays in the preservation of British liberty and security has not yet been fully recognised by the nation and by those responsible for the direction of national affairs.
4. That the Navy League definitely adopts air policy as a concrete part of its propagandist and educational activities, and by every means possible shall urge upon the people that, as aircraft must become more and more the eyes of the British Fleet, it will be a vital factor in the determination of future naval policy.
5. That the Executive Committee of the Navy League, therefore, invites the co-operation of the presidents and chairmen of all branches of the organisation in the United Kingdom and overseas in the advocacy of this view and in support of the demand that an all-powerful air fleet as the necessary complement to the British Navy, with an Air Board raised to a similar status to that now enjoyed by the Board of Admiralty, shall be created.

[It will be remembered that early in 1913, the Navy League, inspired by its great leader, the late Mr. Robert Yerburgh, M.P., made strenuous efforts to interest the people of this country in the prime importance to this country of Air Power, and the building up of a dominant air fleet. Its efforts then met with little success, but they sowed good seed, and it is gratifying to find that the League is continuing the good work.—C. G. G.]

THE INVASIONS OF ENGLAND.

The following official advice to the public was issued on Sept. 5th, and forwarded for publication:—

The results of last night's raid bear out the importance of persons in the open taking the best available cover as soon as they know a raid is proceeding. The comparative lightness of the casualties may be attributed in large measure to most persons having been under cover.

Persons in the open run greater risk than those under cover, and when the simple precaution of going indoors and, wherever possible, moving to a lower floor, affords greater chance of safety, it is folly to remain in the open out of curiosity or bravado.

The following advice is founded on the experience of recent raids:—

As soon as it is clear that a raid is proceeding take the best available cover near at hand by entering the nearest building.

Do not wait for the explosion of bombs as one never knows where the next one may fall.

A doorway or open archway, though some protection, is not good cover, as it does not give security from fragments of a bomb exploding on the ground or flying débris. It must also be remembered that injuries are sometimes caused by our own gun fire, and this can only be avoided by taking cover.

If you are in a building on an upper floor, go downstairs in order to have the best available cover overhead. Avoid positions under skylights, and do not look out of the windows, but keep where you will be out of the line of fragments of metal or débris which may enter by a window or door if the bomb should explode outside.

According to a leading newspaper, "It was reported at the quarterly meeting of the London Hospital on Sept. 5th, that 207 patients arrived at the main entrance of the institution for treatment within an hour of the air raid of June 12th. Most of these were sent home after receiving first aid treatment, but 75 were admitted, and 44 died.

On the first occasion of an air raid warning it seemed that all Whitechapel had crowded into the hospital. Many families left their homes and the institution was invaded by hundreds. The people crowded not only into the basement but into the infectious block and the nurses quarters, and the patients were frightened."

[This seems another matter for the censor. Why should a paper be allowed to make erroneous statements suggesting that air raids on London create panic among the populace?—Ed.]

A TRADE UNION PROTEST.

When the Trade Union Congress was resumed on Sept. 6th at Blackpool, Mr. James Cross, of the Weavers' Amalgamation, Accrington, asked the president if the Parliamentary Committee would accept a resolution with regard to what he described as the "utter inadequacy" of the aerial defences of the country, and the consequent large loss of life involved by enemy air raids.

He said he was prepared to press the subject, but he eventually agreed to let the matter be referred to the General Purposes Committee.

[Lord Montagu's remarks on the subject are worth noting.—Ed.]

FLYING IN BRAZIL.

(Translated from the "Auto Propulsão" of Rio de Janeiro.)

In a recent issue of "Auto Propulsão," of Rio de Janeiro, is an account of the presentation of certificates to the officers completing their course of training for the Naval Aviation Service. The description reads thus:—

The Marine Aviation School had a magnificent ceremony to mark the presentation of pilots' certificates to five of its students, Army officers, and military aerial observers' certificates to seven Naval officers, the last having already gained pilots' tickets.

The President of the Republic and the Minister of Marine made a surprise visit by seaplane from Mauá to the School on Enxadas Island, and in a pretty flight passed over the Monroe Palace, from which they returned to the Island, where they landed at 12.45 to the strains of the National Hymn, played by the band of the Dreadnought "Minas Gorves." The President was photographed standing in the machine, wearing an aviator's helmet; after which, he received the salute of the authorities present, and gave an enthusiastic account of his impressions of the flight and the beauties of the panorama of the city as seen from the air.

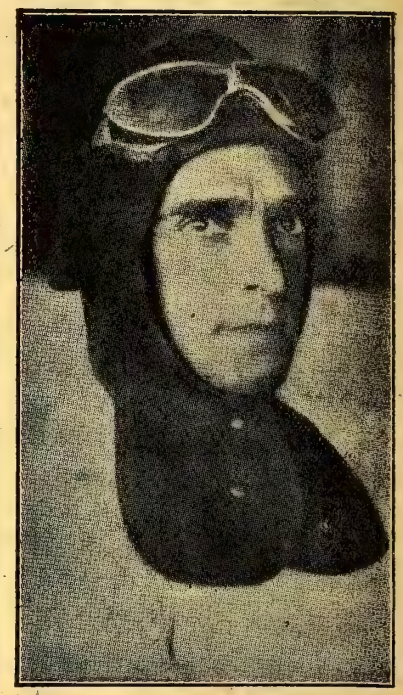
The presentation of the certificates was preceded by the final tests of the pilots, who were:—First Lieut. Raul Vieira de Mello; Sec. Lieuts. Mario Barbedo, Haroldo Borges Leitão, and Anor Teixeira dos Santos, and the Mechanic, Silva Tavares, junior. The examining board was composed of Corvette Captain Protogenes Guimaraes, the School Director, President; Lieuts. Belisario da Moura, Sá Earp and Schrots, Aviator Examiners, the lists consisting of flights, tracing "8s," and spirals.

After the board had compared notes, and passed the candidates, the planes flew off to bring the President and the Minister of Marine from the Mauá station.

At the ceremony were present Admiral Gustavo Garnier, Chief of the General Staff of the Navy; the Minister of War, Commendator Gregorio Seabra, President of the Aero Club of Brazil; Generals Silva Faro and Felippi Aché; Frigate Captain Vieira Mascarenhas, Director of the Naval School; Corvette Captains Protogenes Guimaraes and Antonio Cardoso, Director and Vice-Director of the Aviation School; Colonels Leite de Castro, Vieira Leal and Sisson, Directors of the Military School; Colonel Tasso Fragoso, of the President's Military Staff, a large number of Naval and Military officers, many families and persons of high society.

The military honours to the President were paid by the Naval School, which had remained in the hall during an examination. On the arrival of the president in the hall, all the candidates rose, and Admiral Mourão dos Santos, President of the Examining Board, advanced to receive His Excellency. After the usual courtesies, the company proceeded to the hangar, where the certificates were distributed, after being signed by the Minister of Marine and by the President of the Republic.

The Military Lieutenant-Aviators, Raul Vieira de Mello, Mario Barbedo, Haroldo Borges Leitão and Anor Teixeira dos Santos received pilots' certificates; following which certificates of aviators, military observers, were presented to Naval Lieutenants Belisario da Moura, Heitor Varady, Sá Earp, Schorts, Silva Santos, and Mario Godinho. The President shook hands with each, and at the presentation of the last certificate there was prolonged applause. The Director of the School was warmly complimented by the President.



Corv-Captain Protogenes Guimeraes, Director of the Brazilian Naval School at the Island of Enxadas.

A Group of Aviators at the Brazilian Naval School at the Island of Enxadas.

The Minister of Marine then made a stirring speech, calling upon the young men present to work earnestly for the country, declaring in the name of the President, and as a soldier and Brazilian, his great satisfaction with all that he had seen. The Minister of War also spoke, thanking the Navy for the courtesy accorded to the Army which he represented, and emphasising the ties of friendship, ever more intimate, which unite the two forces of the Union.

Dr. Romulo Avellar wound up, in the name of the Brazilian people, welcoming the President of the Republic. An excellent lunch followed.

Army Lieutenant Raul Vieira de Mello, as soon as he received his certificate, mounted the nacelle of seaplane "C1," and made a fine flight over the city, including a difficult spiral over the Monroe Palace.

During the lunch, the President's sons, José and Francisco Braz, and Dr Raul de Sá, the President's secretary, had several flights in machines piloted by Lieuts. Delamare and Schorts. At a given signal the three School seaplanes rose, piloted by Lieuts. Delamare, Sá Earp, and Raul Vieira de Mello, making an interesting spectacle of the three machines, cutting the air in elegant and daring curves, now high, now in mid-air, and then nearly touching the water. It was 3 p.m. when the President left in the yacht, "Tenente Rosa" for Mauá, whence he returned to Petropolis. The Minister of Marine and other officials returned in the launch "Olga."

On April 22nd Flt. Lieut. Sá Earp made a long flight over the city in seaplane "C3" of the Naval Aviation School. His object was to achieve a height test, making a diagonal over a great part of the city. The machine rose continually for nearly an hour after the start, when the height gauge marked 1,325 metres, a height very difficult to reach with a machine of this type. This brilliant flight gave Lieut. Sá Earp the "record" for the School. In the United States the greatest height reached by flying boats had been 1,680 metres. The pilot carried as passenger Lieut. Epaminondas.

The Minister of War, encouraged by the success of the Naval Aviation School, has decided to establish an aviation school for the Brazilian Army, and has already ordered several machines from the United States, which were due in April to arrive shortly.

The officers charged to choose the most suitable type of machine for the Brazilian Navy in the United States, have reported in favour of the "Standard" type, and are completing their negotiations. The machines chosen will have two 100-h.p. engines each, giving them a speed of 100 miles per hour. They carry wireless, machine-guns, bomb-droppers, and cameras. It is expected that they will be delivered in six months.

About 9 p.m. on April 2nd, whilst flying over Rio Harbour, the hydro-aeroplane "C2," piloted by First Lieut. Belisario de Moura and Sec. Lieut. Fabio Sá Earp, side-slipped. The machine was flying round the Enxadas Island, when something failed, and the machine and its occupants fell into the sea. The great noise of the fall attracted the attention of Customs Officer Alberto Periera, on patrol duty in the guard launch round the German vessels. Making for the place, he found the damaged machine and the two officers wounded and drenched. He rescued them and took them promptly to the Island, and then towed the seaplane to its base. The machine and the pilots were not seriously damaged.

At a meeting of the Brazilian Aero Club a letter was read from General Agobar thanking the Club for its offer of a free entry to the course of the Aviation School for an officer of the Police Brigade, and nominating Sub-Lieut. Travassas for the studentship.

A letter was also read from the Director of the Naval Aviation School thanking the Club for appointing Naval Lieut. Virginius Delamare on its Technical Committee, and expressing his sense of the great services rendered to the cause of aviation in Brazil by the Club.

Senhor Estanislao Woickeckowsky exhibited the drawings of a new machine of his invention, which it was resolved to submit to the Technical Committee.

The President, Commendador Seabra, spoke about the recent occurrences at the Naval Aviation School, praising the work of the Director and his assistants, which enabled the country to count on yet another group of skilful pilots, who will certainly be new pioneers in Brazilian aeronautical progress.

The Aero Club of America, which Santos Dumont represented in the Conference, during the Pan-American Exposition, is exerting itself to make the second Conference, to be held shortly in Rio, a great success, and the Exhibition held in New York made a good preparation for the second Conference. The Aero Club of Brazil, which has the organisation of the Conference in its charge, has carried on an extensive correspondence with similar organisations, and there is good reason to believe that this continual exchange of ideas will prove highly profitable.

The Naval Aviation School has already produced 19 certified pilots, and as the teaching staff is being augmented, it appears that the Brazilian Government intends to increase the number rapidly. Both Army and Navy send candidates to this school.

The Brazilian Navy already possesses several seaplanes. One of these took part in the military parade at Rio on June 11th, making prolonged flights along the route of march with many manœuvres, exciting the awed admiration of the spectators. The journal remarks that this exhibition demonstrated the complete ability of the home-trained pilots, and the necessity of Parliament voting the means to obtain a large aerial fleet, and to form a flying corps.

Towards this, ten American "Standard" seaplanes were due to arrive in July last. These are double-engined machines, with Hall-Scott 100-h.p. engines, bomb-droppers, with Sperry sights, wireless and photographic apparatus.

At least one person, Lieut. Villela, is building aeroplanes to his own designs in Rio. All the wood employed is of native growth. Brazil is well known to be rich in forest products, many of the timbers are not known in Europe. They are in great variety, and it seems possible that an investigation with a view to the opening up of new sources of aeroplane timber would have good results.

[It may be mentioned that the Government of the State of San Paulo, published some years since the results of a pretty complete series of mechanical tests on a large number of timbers from the forests of that State, most of them properly identified by botanical as well as popular names, so that there is some preliminary information to go on. Plenty of wood grows on the coast ranges, but it yields poor timber, being of quick growth. All the good stuff for structural use comes from pretty far inland, and transport is a difficulty.—Translator.]

AIR CURRENTS.

A Secret of the Raid—A True Story.

Overheard in a 'bus "somewhere in London":—

First Lady: "But I am sure they were not aeroplanes."

Second Lady: "What were they then? They say they were not Zepps."

First Lady: "No they were much worse than Zeppelins. I remember the Zeppelin raids. But last night—if you had heard the machinery!—It was dreadful!"

Second Lady: "Well, if they were not aeroplanes, and not Zeppelins, what were they?"

First Lady (with an air of great intelligence and firm conviction): "They were Tawbs of course!"

* * *

A raid story: An old gentleman from the country, tremulous with fear after hearing bombs and gunfire, emerged from his hotel with his wife. In the street they inquired of an imperturbable police-constable if it was "all over." The policeman, imagining they were eager sightseers, said, "Well, I'm afraid, sir, it is all over; but they may return in 'alf an 'our." Rapid departure of old lady and gentleman.

* * *

The pessimists who go about bewailing that woman, because she has embarked on a sea of work, is losing all her femininity in dress and other matters, need not be too downcast. A delightful portrait has just reached England of a young French mechanic stopping her operations on an aeroplane in order to powder her nose and colour her lips.

* * *

The following scrap of dialogue was overheard in a railway train the other evening:—

Lady: "These air raids ought to be stopped."

Soldier: "Well, I don't see how you can stop 'em. Our machines can't be everywhere at the same time. And look at all the air there is in the world. . . . Miles of it, if you come to reckon up!"

RECONSTRUCTION.

*WHITEHEAD AIRCRAFT, LIMITED.

Notice is hereby given pursuant to Section 188 of the Companies (Consolidation) Act, 1908, that a Meeting of Creditors of Whitehead Aircraft Limited will be held at the offices of the said Company's Works, Grena Lodge, Grena Road, Richmond, Surrey, on Thursday, the 20th day of September, 1917, at 11.30 o'clock in the forenoon, for the purposes provided for in the said Section.

Dated the 11th day of September, 1917.

J. A. WHITEHEAD, Liquidator, 31, Townshend Terrace, Richmond, Surrey.

*In order to meet the great expansion of its business, this Company is (in accordance with Resolutions of its shareholders) transferring its undertaking to Whitehead Aircraft (1917) Limited, which Company is being formed for the purpose, with a Share and Debenture Capital of £1,250,000. Whitehead Aircraft, Ltd., has, therefore, necessarily to be liquidated, but pending completion of the above arrangements the business will be carried on as usual by Whitehead Aircraft, Limited. The old Company's Creditors will be taken over by the new Company and their accounts discharged in due course of business.

THE CURTISS CORRUPTION CHARGES.

At the Central Criminal Court on Sept. 4th, before the Recorder, Mr. H. D. Roome, who, with the Attorney-General and Sir Archibald Bodkin, appeared for the prosecution, said he was instructed to apply that the hearing of the case of Mr. William Augustus Casson, on bail, should be postponed until the next Sessions. It was, counsel said, a charge under the Prevention of Corruption Act in respect of commissions alleged to have been received on orders from the Admiralty in respect of aeroplanes.

Mr. Patrick Hastings, counsel for the defence, assented to the application, and the Recorder granted it. The hearing of the case was accordingly postponed until the next Sessions, Mr. Casson being admitted to bail.

JAPANESE AVIATION.

The "Japan Times" states that at present altogether eight Japanese aviators are with the French military flying corps, according to a recent letter from Baron Shigeno, who is taking an active part in the aerial warfare against the Huns somewhere in France. They are Major Isobe, Baron Shigeno, Mr. Ishibashi, Mr. Kobayashi, Mr. Madzume, and three others. Baron Shigeno reports that Mr. Ishibashi and Mr. Madzume have obtained French military aviators' certificates, and the former has been appointed aviation sergeant by the French Government.

Baron Shigeno writes that he has recently been provided with a Spad aeroplane. He says that when he got the machine he was more delighted than if he had been decorated with the Legion of Honour.

While aviation among civilian pilots is generally considered as a thing of the future in Japan, and there is only a handful of local aviators nowadays, it is of interest to learn that a popular aviation school has been recently established at Haneda, near Tokyo, by Mr. Tamai, a civilian aviator, and Mr. Aiba, former editor of the "Aviation World," a popular Tokyo monthly devoted to aerial navigation.

A RECOGNITION OF BRAVERY.

In the official orders of the London Fire Brigade of Sept. 10th, signed by the chief officer, the following were commended "for assisting to save life at the scene of an explosion caused by bombs dropped from enemy aircraft on July 7th., 1917": James Benedictus (London Volunteer Rifles), Firemen, A. P. Livitt, J. W. Patterson, T. J. Lloyd, H. E. Brewer, and T. Ferrow.

A PHILOSOPHIC VIEW.

To the Editor of the "Times."

Sir,—I venture to deprecate the tendency to attribute the success of enemy air raids to the supposed supineness of the War Cabinet in the matter of the Army and Navy Air Services. The best defence is attack at the front, and a thousand defensive planes would not have prevented the raids of the 3rd and 4th Sept. It would be absurd to suppose that bombed French towns insist on the Government giving them local protection, or that bombed military hospitals complain against the military authorities. It should by now be recognised that the bombing of places behind the front line is always possible, and it will be wise for us to realise that aircraft have brought us nearer the front line than we ever were before, and that therefore we must now take our chances with the fighting men.

I am, Sir, your obedient servant,

H. d'Arch Breton, Col. R.E. (ret.),
Mayor of Rochester.

Guildhall, Rochester, Kent, Sept. 7th.

[Which is in agreement with General Brancker's dictum, that though it may be impossible to prevent aeroplanes from arriving, it may be possible to make them afraid to start.—Ed.]

MATRIMONIAL TROUBLES.

The Recorder at the Old Bailey on Sept. 4th postponed sentence on Christopher Roberts, 44, a captain in the R.F.C., who pleaded guilty to bigamy. An inquiry is to be made whether the Army will re-accept him.

It was stated that he joined seven years ago, and rose from the ranks because of his brave conduct in the face of the enemy. Invalided home with shell shock, he had walked about the Embankment at night contemplating suicide on account of the bad state of his nerves. It was then that he met his second "wife," a girl of 20.

* * *

Sentence of one day's imprisonment (he having been in custody since June 21st) was passed by the Recorder at the Old Bailey on Sept. 4th on Samuel Driggett, 27, who pleaded guilty to bigamy. It was stated that he went from America to Australia, where he married. He served in the Australian Army a short time, and deserted. Soon after arriving in England he married two girls, joined the R.F.C., and deserted. His Australian marriage came to light during the hearing of a case at the last Sessions. An officer told the Court that a woman in Quebec was also receiving a separation allowance.

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ON THE COMFORT AND SAFETY OF PILOTS.

At one time or another criticisms of officially designed aeroplanes have appeared in this paper, and in consequence the ignorant, both the wilful and the merely born so, have represented that it has been my object to give the impression that officially designed machines ought not to exist at all and that all trade-designed are perfect. That is very far from the truth, for when occasion has so demanded many suggestions have been made for the improvement of aeroplanes in general, irrespective of their origin. Such occasion occurred recently when I ventured to indicate certain points on which the enemy's machines seemed worthy of study. Another point, not particularly concerning enemy aeroplanes, seems worth raising to-day.

Some time ago a friend of mine, a very clever designer, spent a considerable time and much trouble in going from place to place consulting with pilots on matters of design, with the particular object of finding out why certain machines were popular and why others were not. Being a horribly methodical person, he made a sort of table of the answers to his various questions. When he had finished, he dissected the lot carefully, and found to his surprise that the quality which seemed to weigh most with the pilots themselves was whether they were comfortable in the machines or not.

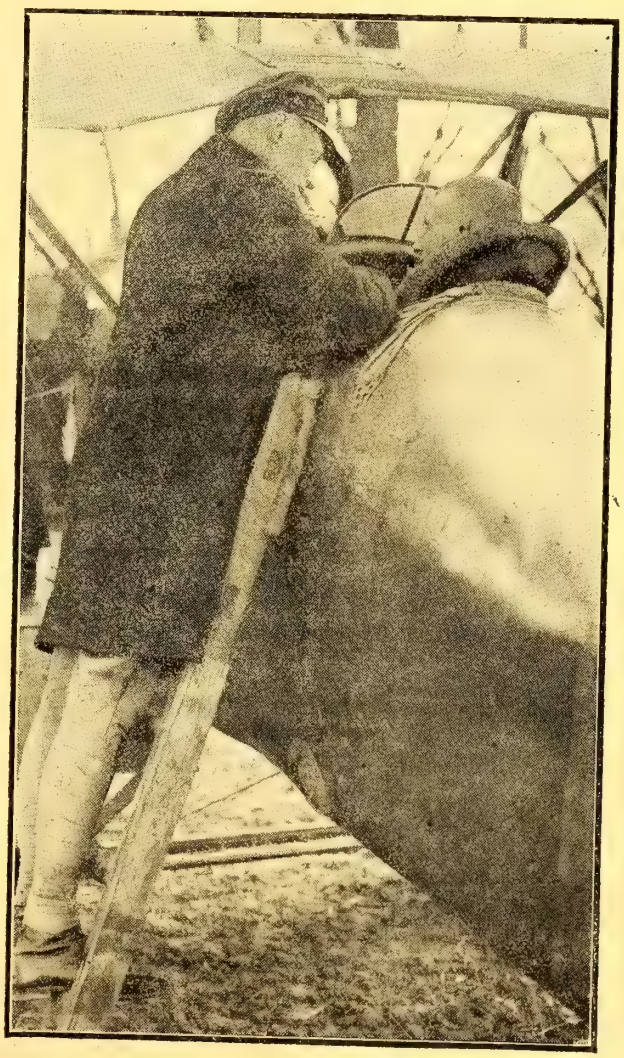
A machine might have wonderful speed, excellent climb, good controllability, and all the rest of the things which the active-service pilot demands; but if the cockpit was uncomfortable, the majority of pilots condemned the machine. On the other hand, a machine might be a trifle slow, might be only a moderate climber, might have a trick of spinning if the pilot was not careful, and might have other bad qualities; but so long as the pilot was comfortable in his seat the machine was popular.

The Pilot's Boudoir.

So pronounced was this feeling that my friend remarked, only half jokingly, "The next time I design an aeroplane, I'm going to design a b—— boudoir for the pilot, and then build the rest of the machine round it."

As Happy Fanny Fields used to say, "Dere vos many a true vord shpoken from der chest," and I strongly recommend aeroplane designers, young and old, trade and official, to keep this in view when next designing a new machine. I am not giving any hint to the enemy by raising the point, because one of the criticisms of British machines which appeared in the reports of the Berlin Aeronautical War Trophy Exhibition was the awkward arrangement of the pilot's "boudoir," which we usually call the "cockpit," and for which that charming writer, M. Lagorgette, of *L'Aérophile*, has coined the elegant word "habitacle"—at least, I imagine he has coined it, for I have never come across it in any other writer.

When one comes to think of it, there is nothing surprising in the pilot's desire for comfort. If one has a long patrol to do, with every nerve alert on the look-out for enemy machines, or enemy troop movements, or enemy submarines, one does not want to have one's attention diverted by a crick in the neck, caused by straining to see over a fuselage which is too high or too wide. Nor, if one is fighting half a dozen Huns at once, does one want to have to keep bobbing up and down and from side to side to see them, at the imminent risk of banging one's anatomy against bits of the machine in doing so. I have never tried the latter alternative, but I should imagine that a project



The late Lieut. Schäfer (on ladder) and Lieut. Baron von Richthofen (in the machine) inspecting the "boudoir" of a new 'chaser, with slab-sided ply-wood fuselage.

ing angle-piece in the funny-bone hurts far more than a bullet in the brain. And, if one has got to die in an aeroplane, one might at least be permitted to die comfortably.

A Case in Point.

One pilot of my acquaintance, who has had considerable experience of active service, tells me that in one fighting machine on which he has flown a good deal—a machine which is admirable in many respects—a strengthening stay cuts into the pilot's back, and another, on which the gun is mounted, crosses between his eyes and the instrument board. Now there you have an excellent example of the minor worries of life which may make all the difference between winning and losing an air fight.

The pilot starts by developing corns in the small of the back—always an uncomfortable part of one's anatomy—and that discomfort may just monopolise his attention at a critical moment, so that he may not see an enemy machine coming for him, and he may be shot down before he knows he is being attacked. And apart from that, continual dodging of the cross-bar in reading his instruments is quite likely to cause eye-strain and to spoil his shooting when he glues his eyes to his gun-sights.

Quite possibly a pilot of a different size might no'

GERMAN AEROPLANES IN THE MAKING.—An interesting attempt to gear down an 8-cylinder Mercédès engine in ar Albatros. The neat arrangement for the junction of the taper ing wood fuselage, the cowl, the propeller, and the propeller pot should be noted, also that the centre of the propeller is cut away inside the cowling.

be thus discommoded in the same machine. The cross-strut might just catch his back in a comfortable place, and his line of sight might be permanently above or below the gun-rail. And thus one might find a dozen pilots who would curse the machine as the most uncomfortable they had ever flown, and another dozen who would swear that they would just as soon be in it as in an armchair in the mess.

A Question of Dimensions.

Unfortunately, one cannot afford to make seats and things adjustable in an aeroplane, owing to the increase in weight which the adjusting gadgets would demand, so the position is rather like that presented to buyers of cars in the early days of motoring before one thought of buying a chassis and having the body built to fit oneself. In those days, and, for the matter of that, in these days, if one bought a standardised cheap car, one did not buy the most pleasing car; one bought the car which was built or designed by the man who was nearest to one's own size. Every works manager built his cars to fit himself, and, if he had short legs, he did not sell cars to long-legged customers: that was all there was to it.

In much the same way, aeroplanes have been designed until recently to fit either the works manager, or the firm's pet test pilot, or the designer himself if he happens also to be a pilot. And then when the machines are delivered, pilots are told off to them, and have to squeeze in anywhere they can induce themselves to fit, if they happen to be what haberdashers call an "out size," in which case they suffer from cramp sooner or later, or else they have to fly with arms and legs at full stretch, which is nearly as bad.

Perhaps there may be by now a sort of "stock-size" in dimensions for cockpits, but, even so, these dimensions only fit stock-size pilots. There does not seem any very obvious remedy, owing to the impossibility of adjusting seating arrangements, as before mentioned, but the matter is one to which designers might well give their attention. The other way out, of course, is to select pilots for certain machines according to the dimensions of those particular machines, but that would involve endless trouble in allotting personnel, and could scarcely be considered.

Naturally, if a lanky pilot has a consuming desire to fly a tiny scout, and finds when he climbs into it that he has to fold up like a three-foot rule to get his feet on the rudder-bar, and to keep his head from sticking holes in the upper plane, he is told to go and fly something where there is more room for him to unroll himself; but that is not quite the same thing as allotting pilots or observers with a tape measure instead of on account of their military capacity.

However, there is the problem. Think it over.

Matters of Detail.

There are many little matters of detail which also seem to deserve more attention than they receive from designers. One pilot, for example, complains that in one very good machine the throttle control is on the side of the fuselage on the right, so that when one wants to control the engine in "split-air spirals" one has to manœuvre the machine with the left hand only. Not being a pilot myself, I cannot judge the precise degree of difficulty involved in doing so, but I should imagine that it varies according to whether the machine is light or heavy on her controls.

Most car drivers are accustomed to swing cars about with the left hand on the wheel while they play with the gear lever with the right, so left-hand manœuvring would probably be easier than right-hand, but I take it that my young friend would prefer to sit dead central in the machine with both hands on the control stick, not because of the extra strength required and thus acquired, but because of the nicer feeling of balance. There seems no particular reason, if that be so, why the throttle control should not be fixed on the stick itself instead of on the side of the fuselage, seeing that Bowden wires are generally used in either case.

It is true that he probably has his gun-control on the stick already, and possibly the engine ignition-switch as well; but if the engine will stand throttling, the switch may as well be fixed to the fuselage instead, for it will only be wanted when landing, or at some other time when it is desired to stop the engine altogether.

Inaccessibility.

In yet another machine, now apparently obsolescent, it was the custom to fit the petrol-pressure valve away under a shelf in an almost inaccessible position, and the petrol cock was equally awkwardly placed. So far as that particular machine is concerned, the matter is not now of much importance, but it is of considerable importance that the error should not be perpetuated in later machines.

In view of the ever-present danger of fire on aeroplanes, both the pressure valve and the petrol cock should be immediately within the reach of the pilot, and, if possible, there should be supplementary controls for them to the passenger's seat, so that, if the pilot is knocked out, the passenger can regulate the pressure and cut off the petrol supply.

Screw-down valves or turn-off taps ought not to be used, as they are small, and one's hand may easily miss them in that instant which makes all the difference between a momentary burst of flame and the setting on fire of the whole machine. It seems probable that a lever of considerable length, with a long travel, which can be slammed open or shut at one blow, would be more advisable.

A Safety Device.

Apropos the fire danger, so far I have heard nothing further of quick-release devices for petrol tanks, a subject which was discussed at some length many months, if not years, ago. Many a machine which lands out of control, even from ordinary engine failure, and only damages the crew, catches fire and burns them to death through the bursting of the petrol tank; whereas, if the petrol could all be shot out of the tank in an instant before the machine hits the ground, there would be no fire.

Even when a machine has caught fire in the air, as has happened only too frequently, the amount of fire could be reduced very considerably if the bulk of the petrol could be released into the air below the machine. If it caught fire from the existing fire as it fell, it would only blaze like the tail of a comet for an instant, and though it might scorch the fuselage and tail, it would certainly do less harm than if it remained in the tank and burnt inside the machine.

Some Examples.

I have not heard full details of the death of that gallant young officer, Major Bannatyne, D.S.O., but from the published reports it seems that the petrol in his machine must have kept on burning for some minutes. There is also the case of the late Sergeant Mottershead, V.C., who brought his machine down in flames and landed safely, thus preserving his passenger's life and dying from burns himself. And a couple of years ago there was the case of Lieut. (now Major) Dyke-Acland, who saved both his passenger's and his own life under similar circumstances (and did not even get an Albert Medal for it).

In all those cases it seems highly probable that, if all

the petrol in the tanks could have been jettisoned at once by throwing open a big valve, or by ripping open a panel in the tank, communicating with a big metal shoot under the machine to prevent the wind from blowing the blazing petrol onto the fabric, the fuel which kept the fire alight would have been consumed in a few seconds, and the smouldering wood and fabric could have been put out with an ordinary squirt fire-extinguisher. The weight of such a release device would be a mere nothing to a modern machine, if the gadgets were properly designed. And if it were decided that the weight was too great to permit of its use on the small fighting machines, where every ounce counts against speed and climb, it could at any rate be used on big bombing machines and on home training machines.

Wood Fuselages Again.

Incidentally, there seems to be hereabouts a further argument in favour of using three-ply wood for fuselage covering. If petrol thus suddenly released did catch fire and spread itself over the fuselage owing to the course of the airstreams round the body of the machine, it seems much less likely that it would burn through ply-wood than through loose fabric.

The best of non-inflammable dopes will fry up and frizzle in a direct flame, and if the fabric under the dope is set on fire it will blaze if subjected to a draught, whereas it is possible to make wood practically fire-proof by impregnating it with certain chemicals. Also, the flat, hard, polished surface of wood, treated with non-inflammable varnish, would shed most of the petrol as soon as it touched it, and, anyhow, would be very hard to burn through.

I wonder whether the Germans' almost universal use of wood-covered fuselages has anything to do with their being less liable to fire than fabric covering, in addition to their many other advantages, as discussed a couple of weeks ago.

Anyhow, there is the suggestion for what it is worth. Our designers, official and unofficial, will do well to study the question, for undoubtedly some sort of assurance that the danger of fire is being materially reduced will contribute quite considerably to the comfort of mind of pilots, both at home and abroad. The removal of the ever-present idea of fire from the back of a pilot's mind will probably conduce to his comfort as much as the removal of the ever-present cross-strut from the small of his back.

THE DURATION OF THE WAR—(*Continued*).

BY ROGER BAYONS.

One of the minor newsprints has during the past week published an article containing figures purporting to give the numbers of personnel available to the Central Empires immediately before the war and at the present time. It is stated therein that Germany began the war with a mobilisable strength of 14,000,000 men if all classes up to that of 1920 were included. Of these casualties and unfitness are said to account for seven and a half millions, leaving in the field a force of 6,500,000. If these calculations are to be relied upon, there is little solace for those who say that our enemies are at the present time short of men.

No note is made of the men under arms belonging to the allied States of Austria-Hungary, Turkey, and Bulgaria. If their resources be added, the supply of trained men would appear to be huge.

But, as was pointed out a fortnight ago, the Germanic allies do not lack men under arms and engaged in one or other of the occupations forming an integral part of the operations of war. They have sufficient for their present needs in the field. Their difficulty is in the necessary reserves.

As week succeeds week in the progress of the war, and Great Britain and its supporting nations bring more and more men into the field, it will be possible for us to expend, if necessary, two lives of our men to every German life extinguished in battle without feeling seriously the loss involved. But the enemy, on the other hand, cannot replace such losses. And it may be that on conditions such as these we must base our hopes of victory.

It is not necessary to lose two men that one enemy soldier may die, but it is of vital importance to be able to do so without effort. In the absence of other and quicker means, the destruction of enemy personnel will serve to bring victory to the Allies.

Matériel.

The supply of matériel is the next matter of great importance in the decision of the war. As days pass by, warlike effort intensifies, and the amount of matériel used in each operation increases rapidly. A preliminary bombardment of to-day uses as many shells as a year of war in a period not yet very remote. The combined casualties of a modern battle, extending over weeks instead of hours, and hundreds instead of tens of miles, often more than double the entire losses of the South African War.

Quantities equalling the whole reserve of shells of all categories in the British Army of pre-war days are now expended in a single week. And such expenditure has become a deciding factor. Success by skilful manœuvre is less common, and has almost entirely been replaced for the present by the crushing effect of bombardment. Our advances in France are largely the result of superior volume of fire, and are not always in any great degree to be attributed to a higher quality in the troops engaged on our side, nor to greater skill in the higher command.

Under the prevailing conditions of trench warfare, under which neither army cares to put their fortunes to the test of open warfare, troops can be driven from their positions by sheer weight of metal, provided that the counter-bombardment does not equal the attack. When conditions are equal, success lies with him who has made the better dispositions and is in command of troops possessing higher moral than the enemy.

The paramount importance of the production of vast quantities of munitions of war is therefore obvious. There is a plentiful quantity of all that goes to the production of matériel in the various countries forming the Germanic alliance, but it is questionable whether the complications of war permit the enemy to make full use of his resources.

Coal is necessary in the manufacture of steel, but coal is equally necessary for the conveyance of materials to the steel-producing plants. The normal transport of the troops cannot in any way be reduced, because the Krupp factories are short of the various substances proper to their business. The question of supply is complicated by shortage of labour consequent on the losses in man-power, and, to a degree, on the reduction in the national physique owing to food shortage. All things in the national life are interwoven and interdependent.

Increased Production.

There cannot be an increase in the production of aeroplanes in an efficient State (an inefficient State might increase production by a change of method) without a consequent reduction in the supply of some other instrument of war. If greater quantities of the 5 in. howitzer are constructed, then the number of new guns of another category will lessen in some manner.

All these considerations apply, also, to ourselves and our Allies, but to a lesser degree. The possession of the freedom of the seas enables us to place contracts for matériel in neutral countries, thus reducing the necessary construction within our own borders. The question of the supply of labour does not affect us greatly. Our favoured position in this matter cannot fail to improve our chances in the war.

The necessities of the case have induced the German and his subordinate allies to concentrate on specialised instruments of war. For instance, it is said that he has realised the high virtues of a particular category of big gun, and has in consequence reduced his output of other types in order that he may produce enormous quantities of that on which he places special reliance.

Reduction of Types.

In aeronautics he would appear to have definitely tabulated his types of aircraft. In consequence, if report be true, he has eliminated machines of a design which, while excellent in its way, is not absolutely essential. His resources in this matter are directed to the building of a few designs of special excellence, each of which has been drafted with a clearly defined object.

He knows, or believes he knows, the best machines under present conditions for such widely different duties as strategical reconnaissance, spotting for artillery, long-distance bombing raids, and aerial fighting.. Whether his types are well chosen or not, there is definite gain in the reduction of the number of types in course of manufacture. It is far easier to produce 1,000,000 Ford motor-cars in a given time than it is to turn out 100,000 each of ten cars of different design ranging from the Rolls-Royce to the Bugatti, assuming for the sake of argument that the quality of production is the same in all cases.

And so it is through all the different branches of the productive side in the German military machine. Everything has been simplified in so far as is possible. Therefore, if we are in the advantage as to the quantity of production, how much more shall we be superior in this matter if we, too, co-ordinate to a similar degree?

The Press—in Parenthesis.

En parenthèse it might be well to extend the operation into the domain of the Press, and have one newspaper devoted to agitation and the dissemination of the lies of the Clubs and Tower Hill, another to act as official admirer to the Government in power, one to tell us how inefficient the professional soldier is on all occasions, and another to uphold his reputation as a sober Christian. People can construct their own lists of a pleasant Press. Fleet Street might be sadder, but there would be amusement in the world for a space.

There is a pleasant attraction in the idea of an amalgamated paper penned from the Press of to-day—a combined "Daily Mail," "John Bull," and "Police Gazette." Think, too, of a paper entirely devoted to the praise of Selfridge instead of illimitable advertisements in many journals! Such a change might even help to win the war. But this is a digression.

The Food Question.

The food question is no more trouble to the Central Powers than it was at the time of the last articles of this series. In truth, it has probably improved greatly.

GERMAN AIRCRAFT PRODUCTION.—Drilling small parts with a very neat form of electric sensitive drill. One does not notice any evidence of acute starvation. The chalked notice at the back means "Beware of Pick-pockets," which may imply inherent moral obliquity among the working classes, or may be only a joke, or may be an evidence of acute starvation.

In the first few months of the war people were disinclined to order their lives on a simpler scale than had commonly obtained in the days of peace and unrestrained luxury. The same extravagance and the same waste continued until the unexpected duration of the war brought about a shortage.

The lack of customary articles of food was then felt with an intensity that always accompanies the breaking of established habit. The Englishman for generations has been accustomed to eat bacon at his breakfast. In France he finds it is not usual, and he at once assumes that France must be immoral.

The lapse of time since the war began—a space of three years filled with the experience of a generation of peace—has reduced the rations of the civilian to a habit scarcely less strong than that of the days of plenty. The shortage of meat has been less noticeable of recent months, in so far as the general public of enemy countries is concerned, than a bad champagne year was formerly, as felt by the world in general.

With experience, the enemy has learnt how to conserve such food as he has within his borders. There has been a growing equalisation of supply throughout all the allied countries. A little thought will indicate, even to those to whom an atlas and the knowledge which it conceals has no attraction, what vast sources of food supply are still in the hands of the Kaiser's legions. Few things are certain in this world, but among them must be included the certainty that land in German possession is not producing less in these days than in previous years. Certain it is that the area behind the German lines in France has been cultivated this year with no less intensity than in pre-war days.

In addition to the growth of new habit and the better distribution of the food, it is probable that large supplies have entered Germany and Austria from Russia. The Russian battle line has been undecided and indeterminate since His Imperial Majesty the Tsar was imprisoned by his rebellious subjects, and it is unlikely that the Germans have lost any opportunity of taking material advantage of the existing position.

Unity and Co-ordination.

The duration of the war and the decision as to the ultimate victory remain entirely in the hands of the Allies. If we remain united and wait until the return of peace for the settlement of our varied troubles, then it is certain that we will be the victors. With true unity and co-ordination of effort, there is little reason why the war should not end during the early summer of 1918.

If, on the other hand, disunion enters into the Alliance, the end of the war will be postponed indefinitely, and there is a chance of Germany being the victor. The defection of Russia, which must be regarded as a possibility if not actually a probability, will prolong the war for months and even for years.

Given a continuance of present conditions, the end of the war is in sight, but little is certain in human existence. One thing is certain—talk will do little, action alone can help towards victory.

A LONDON MEETING.

On Wednesday, October 3rd, a public meeting will be held at the Central Hall, Westminster, at 8 p.m., in support of an agitation for an Increased Air Service.

The meeting is being organised by the National Imperial Association, and the chair will be taken by Mr. F. M. Russell Davies.

The speakers will be Mr. W. Joynson-Hicks, M.P., and Mr. J. H. Havelock Wilson, who are to be supported by the Mayors of London Boroughs, East Coast Towns, and other influential persons.

A limited number of reserved tickets are to be had for 5s. and 2s. 6d. each. Other seats are free.

Applications for tickets should be addressed to the hon. secretary of the Association, at 109, Victoria Street, Westminster, S.W.

THE AERONAUTICAL HISTORY EXHIBITION.

Mr. Asquith has promised to perform the opening ceremony at the Air Service Exhibition to be inaugurated in Leeds on September 27th. The Exhibition is under the auspices of the Army Council and the Air Board, and was organised by the Countess of Drogheda in aid of the Flying Corps Hospital.

THE R.F.C. HOSPITAL FUND.

The Overseas Club has handed over a further cheque for £4,000 to Lady Henderson on behalf of the Royal Flying Corps hospitals. This brings the total collected by Overseas Club members for this fund to £16,000.

A WARNING OF INVASION.

Lieut. General Sir Francis Lloyd, G.O.C. the London district, in opening a fête at Brunswick Park, Camberwell, on Sept. 13th, warned the country to be prepared for the possibility of invasion. The fête was on behalf of the Mayor of Camberwell's Fund for removing the debts on the newly-acquired headquarters of the Camberwell Battalion of the London Regiment of Volunteers. The Mayor, Alderman Thomas Coombs, presided.

Sir Francis Lloyd said that never did we more require every possible man, either to fight or to be ready to fight, than at the present moment. As was well known, it was quite a possibility that we might have to fight here. Let them look at the determination of the enemy, not only in fighting at the front, but in invading this country by aircraft. And, undoubtedly, their determination to bring every possible method to bear against us was indicated by the way they had abandoned the Zeppelin method when they found that they did not meet with great success, and turned to the more difficult form by large aeroplanes, with which they had been invading Great Britain recently.

"Do you think," he asked, "they are likely to stop at that if they get the chance? It is quite possible that if they find that the game is up they will make one last and determined throw to invade this country, and so to turn the tables upon us, and for that we must be absolutely prepared."

A MOTION.

Councillor J. Mitchell, of Westcliffe-on-Sea, intends at the next meeting of the Southend Council to move the following resolution :—

"That the town clerk be instructed to write to Mr. Rupert Guinness, M.P., for South-East Essex, and request him to furnish full particulars of any action he may have taken to convince the Government of the urgent and immediate necessity for air reprisals which, in the opinion of this council, would tend to prevent the women and children of this borough from being murdered."

He suggests that every council should pass a similar resolution, and says :—

"Then M.Ps. will recognise that, failing a satisfactory answer, their services will not be required after the next election."

EDITORIAL NOTICE.

Arrangements have been made to publish each week, commencing September 26th, a special article commenting upon all matters connected with or relating to Companies affiliated or kindred to the Aircraft Industry.

This feature will be contributed by a well-known specialist in financial matters, and will deal particularly with—

Company Reports and Official Notices.

Stock Exchange Quotations.

Treasury and Stock Exchange Regulations and By-laws.

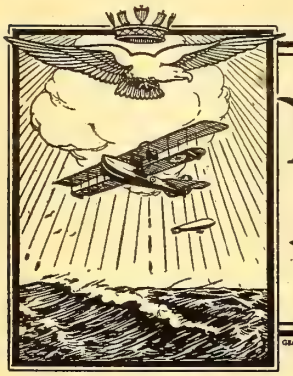
The notification of, and advice regarding, new Capital Issues.

Criticism and publication of Directors' Reports and Balance Sheets.

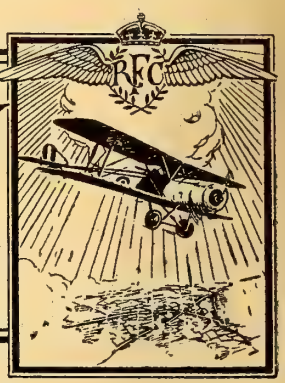
A special feature of the contribution will be "Replies to Correspondents," whose enquiries will be answered free of charge in these columns.

Special Note.

The Editor will feel obliged to Secretaries and other Company Officials if they will kindly address all Company Notices and Balance Sheets, as and when published, to the "Finance Editor," The Aeroplane, 166, Piccadilly, London, W.1.



NAVAL and MILITARY AERONAUTICS



FROM THE "LONDON GAZETTE."

Admiralty, Sept. 3rd.

R.M.—Capt. A. C. St. Clair-Morford, M.C., is secd. for service with Army (R.F.C.), July 7th.

Admiralty, Sept. 10th.

Sept. 12th.—R.M.L.I.—Capt. (temp. Maj.) Henry Fawcett returns to Corps duty from the seconded list, and is absorbed in the estabt., vice Maj. Williams, absorbed, August 23rd, 1917. Capt. (temp. Maj.) Henry Fawcett relinquishes the rank of temp. Maj. on alteration in posting, August 23rd, 1917.

War Office, Sept. 11th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing.—Staff Officers, 3rd Cl.—(Graded as a Staff Capt.).—Lt. A. J. W. Barmby, York. R., and to be secd., vice Maj. H. Elwell, R. Suss. R., T.F., and to be temp. Capt. whilst so empld., June 29th.

Flt. Comdrs.—Capt. I. C. Barclay, Sea. Highrs., Aug. 27th. From Flying Officers. And to be temp. Capts. whilst so empld. :—Lt. E. M. Smith, Spec. Res.; Lt. P. R. Meredith, Spec. Res., Aug. 1st. Sec. Lt. D. U. McGregor, Spec. Res., Aug. 19th. Temp. Lt. W. P. MacD. Brettell, Gen. List, Aug. 21st. Sec. Lt. C. C. Morley, Spec. Res., Aug. 23rd. Lt. R. N. Wolton, R.F.A., T.F., Aug. 24th. Lt. H. Hulbert, Spec. Res., Aug. 26th. Lt. A. Lang, Spec. Res.; temp. Sec. Lt. G. C. Dell-Clarke, M.C., Gen. List; Sec. Lt. (temp. Lt.) C. J. Temperley, Cyclist Bn., T.F.; Sec. Lt. (temp. Lt.) F. T. Woods, North'd R., T.F.; Lt. E. R. H. Pollak, R.F.A., T.F.; temp. Sec. Lt. B. A. Taylor, Gen. List; temp. Lt. E. Newling, Gen. List; Lt. B. James, Spec. Res.; Lt. D. S. Evans, Spec. Res.; Sec. Lt. T. E. Gorman, Spec. Res., Aug. 27th.

Balloon Co. Comdrs. (graded as Flt. Comdrs.).—Capt. P. G. Bateman, Lond. R., T.F., from a Balloon Comdr., Aug. 17th. And to be temp. Capts. whilst so empld. :—Lt. T. G. G. Bolitho, M.C., Spec. Res., from a Balloon Comdr., Aug. 19th. Sec. Lt. (temp. Lt.) R. Hofmeyer, Yorks L.I., from a Balloon Officer, Aug. 25th.

Adjt.—Lt. G. Philippi, M.C., Dns., Spec. Res., from a Flying Officer, and to be temp. Capt. (with pay and allowances as Lt.) whilst so empld., Aug. 23rd.

Special Appt. (graded as an Equipment Officer, 1st Cl.).—Lt. (temp. Capt.) O. G. W. G. Lywood, Norf. R., from a Flt. Comdr., and to retain his temp. rank whilst so empld., Aug. 23rd.

Schools of Instruction.—Schools of Aerial Gunnery.—Chief Instr. (graded as a Sqdn. Comdr.).—Lt. (temp. Capt.) W. A. Bishop, V.C., D.S.O., M.C., Canadian Local Forces, from a Flt. Comdr., and to be temp. Maj. whilst so empld., Aug. 28th.

Central Flying School.—Instr.—Temp. Lt. (temp. Capt.) H. M. Sison, M.C., A.S.C., from a Flt. Comdr., vice Sec. Lt. (temp. Maj.) A. M. Vaucour, M.C., R.A., Aug. 22nd.

War Office, Sept. 12th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing.—Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld. :—Lt. D. H. M. Cartery, R.A., August 26th. Lt. S. B. Horn, D. Gds., August 29th.

Gen. List.—Flt. Sgt. E. H. Lawford to be temp. Sec. Lt., July 21st.

Memorandum.—Temp. Hon. Lt. A. B. Rogers to be temp. Hon. Capt. whilst empld. as Inspr., Aeron. Inspn. Dept., Dec. 9th, 1916.

War Office, Sept. 13th.

REGULAR FORCES.—Staff.—Temporary Appointments at the War Office.—Asst. Dir.—Temp. Lt.-Col. R. F. Drury, Gen. List, from a Dep. Asst. Dir., August 18th, 1917.

Dep. Asst. Dirs.—August 18th, 1917: Temp. Maj. A. Struben, Gen. List, from a Staff Capt., vice temp. Lt.-Col. R. F. Drury, Gen. List; Sec. Lt. (temp. Capt.) E. E. Robb, R.F.C., Spec. Res., from an Equipment Officer, 1st Cl., and to retain his temp. rank whilst so empld.

G.S.Os., 3rd Grade.—Maj. J. K. N. V. Bunbury, R. W. Surr. R., Spec. Res., August 22nd, 1917. Capt. H. G. Money, Middx. R., and to be secd. August 22nd, 1917.

Staff Capts.—Temp. Capt. F. R Freeman, Gen. List, vice temp. Maj. A. Struben, Gen. List, August 18th, 1917.

Establishments. — R.F.C. — Sqdn. Comdrs. — From Flt. Comdrs., and to be temp. Majs. whilst so empld. : Capt. G. Allen, Conn. Rang., February 11th, 1917. Lt. (temp. Capt.) F. C. Sherren, M.C., Canadian Local Forces, August 1st, 1917. Sec. Lt. (temp. Capt.) J. O. Archer, R.F.A., Spec. Res., Sept. 10th, 1917.

Flt. Comdrs.—From Flying Officers and to be temp. Capts. whilst so empld. : Sec. Lt. (temp. Lt.) G. Aste, A.S.C., Spec. Res., August 1st, 1917. Lt. J. W. Francis, Spec. Res., August 28th, 1917. Lt. G. C. Rogers, Canadian Local Forces, August 31st, 1917. Capt. (temp. Maj.) A. G. Moore, M.C., Manch. R., Spec. Res., reverts from a Sqdn. Comdr., and relinquishes his temp. rank, August 27th, 1917, with seniority from Jan. 27th, 1916.

Balloon Co. Comdr.—(Graded as a Flt. Comdr.).—Lt. G. B. Robotham, Notts. and Derby. R., T.F., from a Balloon Comdr., and to be temp. Capt. whilst so empld., August 25th.

Adjt.—Capt. T. B. Hornblower, R. Suss. R., T.F., and to be secd., July 30th.

Gen. List.—Sec. Lt. H. O. Fellowes, Sea. H., T.F., to be temp. Capt. (without the pay or allowance of that rank) whilst empld. as Adjt., August 15th, 1917.

War Office, Sept. 14th.

REGULAR FORCES—Establishments.—R.F.C.—Mil. Wing.—Wing Comdr.—Capt. (temp. Maj.) J. C. Halahan, Res. of Officers from a Sqdn. Comdr., and to be temp. Lt.-Col. whilst so empld., Sept. 1st.

Spec. Appts.—(Graded as Sqdn. Comdrs.).—From Flt. Comdrs. and to be temp. Majs. whilst so empld. :—Temp. Capt. S. E. Parker, Gen. List, Aug. 23rd. Lt. (temp. Capt.) C. H. Nicholas, S. Wales Bord., Spec. Res., Aug. 27th.

* * *

The King has been pleased to approve of the award of the following honours, decorations, and medals to Officers and Men for services in action with enemy Submarines :—

Distinguished Service Cross.

Flt. Lt. (Actg. Flt. Comdr.) Osborne Arthur Butcher R.N.A.S.
Flt. Lt. John Osborne Galpin, R.N.A.S.
Lt. John Henry Blyth, R.N.R.
Flt. Sub-Lt. Charles Leslie Young, R.N.A.S.

Bar to the Distinguished Service Cross.

Flt. Lt. Warren Rawson Mackenzie, D.S.C., R.N.A.S.

Distinguished Service Medal.

Air Mech., 1st Gr., Henry Leslie Curtis, O.N. F24994; Air Mech., 2nd Gr., William Henry Grey, O.N. F6068.

* * *

The following Officers and Man have been mentioned in dispatches :—

Flt. Sub-Lt. Sidney Ernest Ball, R.N.A.S.
Flt. Sub-Lt. Arthur Thomas Barker, R.N.A.S.
Air Mech., 2nd Gr., Walter James Priest, O.N. F21948.

* * *

The King has been pleased to approve of the award of a Bar to the Distinguished Service Order to the following Officer :—

Flt. Lt. (Actg. Flt. Comdr.) Robert Alexander Little, D.S.O., D.S.C., R.N.A.S.

For exceptional gallantry and skill in aerial fighting. On July 16th he observed two Aviatiks flying low over the lines. He dived on the nearest one, firing a long burst at very close range. The enemy machine dived straight away, and Flt. Lt. Little followed him closely down to 500 ft., the enemy machine falling out of control. On July 20th, he attacked a D.F.W. After a short fight the enemy machine dived vertically. Its tail plane seemed to crumple up, and it was completely wrecked. On July 22nd, he attacked a D.F.W. Aviatik, and brought it down completely out of control. On July 27th, in company with another pilot, he attacked an Aviatik. After each had fired about 20 rounds, the enemy machine began to spin downwards. Flt. Lt. Little got close to it, and observed

both the occupants lying back in the cock-pits, as if dead. The machine fell behind the enemy's lines, and was wrecked. Flt. Lt. Little has shown remarkable courage and boldness in attacking enemy machines.

DISTINGUISHED SERVICE CROSS.

Flt. Lt. (Actg. Flt. Comdr.) Robert Jope Slade, R.N.A.S.
For his services during a bombing raid on Snelleghem Aerodrome on August 5th. He was attacked by an enemy machine when leaving the target. After firing about thirty rounds the hostile machine appeared to lose control and suddenly dived without regaining it.

Flt. Lt. (Actg. Flt. Comdr.) William Melville Alexander, R.N.A.S.
On August 16th he attacked at about 3,000 ft. two hostile scouts, one of which, after a short combat, fell completely out of control. On August 20th, while returning from patrol, he observed three enemy scouts. These he pursued until they turned to fight. One of the scouts he shot down completely out of control, and the remaining two dived away. On August 21st, while on an offensive patrol, he attacked and drove down completely out of control an enemy scout, which was attacking another member of his patrol. Flt. Lt. Alexander has at all times shown the greatest bravery and determination.

Flt. Sub-Lt. Charles Philip Oldfield Bartlett, R.N.A.S.
For exceptionally good work on the occasion of a bombing raid on Houttave Aerodrome on July 25th, 1917.

BAR TO THE DISTINGUISHED SERVICE CROSS.

Flt. Comdr. Irwin Napier Colin Clarke, D.S.C., R.N.A.S.
For exceptionally good work on the occasion of a bombing raid on Houttave Aerodrome on July 25th, 1917. This officer has shown great skill and persistence in leading his flight on many occasions.

DISTINGUISHED SERVICE MEDAL.

Air Mech., 1st Gr., Edward Darby, O.N. F849; Air Mech., 1st Gr., William David Sambrooke, O.N. F6630.

* * *

The following Officers have been mentioned in dispatches:—

Flt. Comdr. Charles Teverill Freeman, D.S.C., R.N.A.S.
Flt. Comdr. Thomas Frederick Le Mesurier, D.S.C., R.N.A.S.

* * *

THE FOLLOWING DECORATIONS HAVE BEEN CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC:—

LEGION OF HONOUR.

OFFICIER.

Capt. Charles L. Lambe, D.S.O., R.N.
Comdr. Henry C. Halahan, D.S.O., R.N.

CHEVALIER.

Sqdn. Comdr. Francis K. Haskins, D.S.C., R.N.
Sqdn. Comdr. Douglas C. S. Evill, D.S.C., R.N.
Sqdn. Comdr. Redford H. Mulock, D.S.O., R.N.A.S.

WAR OFFICE, Sept. 15th.

REGULAR FORCES.—STAFF.—ATTD. TO HEADQUARTER UNITS.—Brig. Comdr.—Maj. (temp. Col.) T. C. R. Higgins, R. Lanc. R., and to be temp. Brig.-Gen. whilst so empld., Sept. 1st, 1917.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Wing Comdr.—Capt. (temp. Maj.) C. T. Maclean, M.C., R. Sc. Fus., from a Sqdn. Comdr., and to be temp. Lt.-Col. whilst so empld., Aug. 21st.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld.:—Temp. Lt. E. S. Moulton-Barrett, Gen. List; Lt. C. A. Lewis, M.C., Spec. Res.; Sec. Lt. (Lt., Canadian Mila.) L. P. Watkins, Spec. Res.; temp. Sec. Lt. G. G. Boyton, Gen. List, Aug. 1st. Temp. Lt. N. Goudie, Gen. List; Lt. H. H. Griffith, Spec. Res., Aug. 27th; temp. Sec. Lt. H. Kirton, Gen. List., Sept. 1st.

Balloon Co., Comdrs.—(Graded as a Sqdn. Comdr.).—Capt. G. F. H. Faithfull, Ind. Army, and to be temp. Maj. whilst so empld., Aug 30th, but with seny., without pay or allowances, Dec. 5th, 1916. (Graded as a Flt. Comdr.).—Lt. T. G. Thornton, York. R., T.F., from a Balloon Comdr., and to be temp. Capt. whilst so empld., Aug. 30th.

Gen. List.—Sgt. J. F. Ridgway, from R.F.C., to be temp. Sec. Lt., Aug. 27th.

WAR OFFICE, Sept. 17th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Flt. Comdrs.—From Flying Officers, and to retain their temp. rank while so empld.:—Temp. Capt. G. H. Gordon, Gen. List; Lt. (temp. Capt.) G. G. Hubbard, Spec. Res., Sept. 1st. Temp. Sec. Lt. C. O. B. Beale, D.S.O., Gen. List, from a Flying Officer, and to be temp. Capt. while so empld., Sept. 2nd.

Gen. List.—S.Q.M.S. Walter Daughton, from R.F.C., to be temp. Sec. Lt., Aug. 24th.

Officers who have been granted temp. rank or temp. commns. under "Memoranda" for duty with R.F.C., are now granted such temp. rank or temp. commns. on Gen. List, R.F.C., retaining their present seny.

MEMORANDUM.—Lt.-Col. C. O. Smeaton, C.B., h.p. list, retires on ret. pay, Aug. 3rd, 1917.

The King has been pleased to approve of the following Reward for distinguished service in the Field:—

DISTINGUISHED SERVICE ORDER.

Maj. (temp. Lt.-Col.) Norman Duckworth Kerr Macewen, Arg. and Suth'd Highrs. and R.F.C.

* * *

The names of the following have been brought to the notice of the Secretary of State for War for valuable services rendered in connection with military operations in the Field:—

ROYAL FLYING CORPS.

Floyer, Lt. E. A., I.A.R.O. and R.F.C.; Henderson, Lt. T., R.E. and R.F.C.; Leeson, Sec Lt. B. E., Ches. R. and R.F.C.; Ross, Maj. A. J., D.S.O., R.E. and R.F.C.; Siddons, Sec. Lt. V. D., North'n R. and R.F.C.; Stafford, Sec. Lt. W. G., Gen. List; Stent, Lt. (temp. Capt. in Army) F. W., R.F.C. (Spec. Res.); Thomson, Sec. Lt. (temp. Lt.) D. N., Yeo. and R.F.C.; Catchpole, No. 6737 Cpl. C. J.; Colwill, No. 1859 Cpl. R.; Gibson, No. 1753 Flt. Sgt. G. A. F.; Pound, No. 3030 1st Cl. Air Mech. F.; Teasdale, No. 16933 Cpl. C. E.; Warr, No. 5986 1st Cl. Air Mech. C. J.; Wilder, No. 8268 1st Cl. Air Mech. J. F.; Wright, No. 2567 Sgt. H. H.

[These appear to be in connection with operations from Egypt.—Ed.]

* * *

The King has been pleased to approve of the appointments of the following Officers to be Companions of the Distinguished Service Order in recognition of their gallantry and devotion to duty in the field:—

Sec. Lt. (Temp. Capt.) William Charles Campbell, M.C., R.F.C., Spec. Res.
For conspicuous gallantry and devotion to duty on numerous occasions whilst on offensive patrols. He has displayed the greatest courage and skill in attacking enemy aircraft at close range, destroying some and driving others down out of control. He has proved himself to be a scout leader of the highest class, and has destroyed 12 hostile machines and two balloons, besides taking part in many other combats during the last three months. By his fearlessness and offensive spirit he has set a splendid example to all ranks.

Lt. (Temp. Capt.) William John Charles Kennedy-Cochran-Patrick, M.C., Rif. Bde. and R.F.C.
For conspicuous gallantry and devotion to duty on numerous occasions in destroying and driving down hostile machines, frequently engaging the enemy with great dash and a fine offensive spirit when encountered in superior numbers. By his cool judgment and splendid fearlessness he has instilled confidence in all around him, his brilliant leadership being chiefly responsible for his numerous successes.

Sec. Lt. (Temp. Capt.) Harold Melsome Probyn, R. War. R., and R.F.C.
At a critical time when hostile infantry had penetrated our trenches, he went up in unfavourable weather, and under heavy machine-gun and anti-aircraft fire from guns of heavy calibre and managed to locate and report with complete accuracy the position and progress of the enemy. To do this he had to fly at a very low altitude, during which his machine was seriously damaged by enemy fire. The following day he carried out another daring and successful reconnaissance of the enemy's lines, bringing back information of the greatest value. He has already experienced a whole year's strenuous service flying, a fact which speaks for his gallantry and endurance on both of these particular occasions.

Sec. Lt. Alfred Seymour Shepherd, M.C., R.F.C., Spec. Res.
For conspicuous gallantry and devotion to duty on numerous occasions when engaged in combat with hostile aircraft. Though surrounded by enemy machines, he continued to fight for nearly an hour with the utmost gallantry and determination against two hostile formations, finally bringing down one of the enemy out of control. Within a month he brought down seven hostile machines completely out of control.

Lt. (Temp. Capt.) John Whitaker Woodhouse, M.C., R.F.C., Spec. Res.
For conspicuous gallantry and devotion to duty in carrying out special missions by night, during which he has frequently been compelled to face very bad weather. In the course of numerous bombing expeditions by night he invariably descended to very low altitudes in order to use his machine gun against hostile troops on the roads. He has consistently set a very fine example.

* * *

The King has been pleased to award a Bar to the Military Cross to the undermentioned Officers:—

Temp. Lt. Louis Fleeming Jenkin, M.C., Gen. List and R.F.C.
For conspicuous gallantry and devotion to duty in continually attacking hostile aircraft at close range, destroying some and driving others down out of control. His dash and offensive spirit have at all times been admirable. (M.C. gazetted August 16th, 1917.)

Sec. Lt. (Temp. Capt.) Arthur Gordon Jones-Williams, M.C., Welsh R. (attd. R.F.C.)
For conspicuous gallantry and devotion to duty when

engaged in combat with hostile aircraft. On several occasions he attacked enemy formations although they were in superior numbers, fighting them in more than one instance single-handed, and showing the finest offensive spirit. He drove several machines down completely out of control, fighting until his ammunition was expended. (M.C. gazetted July 18th, 1917.)

Sec. Lt. Arthur Percival Foley Rhys-Davids, M.C., R.F.C., Spec. Res.

Whilst on offensive patrols, he has in all destroyed four enemy aircraft, and driven down many others out of control. In all his combats his gallantry and skill have been most marked, and on one occasion he shot down an enemy pilot who had accounted for 29 Allied machines. His offensive spirit and initiative have set a magnificent example to all. (M.C. gazetted July 18th, 1917.)

* * *

The King has been pleased to confer the Military Cross on the following Officers in recognition of their gallantry and devotion to duty in the Field :—

Temp. Lt. Percy John Barnett, Gen. List and R.F.C.

For conspicuous gallantry and devotion to duty on many occasions. His reconnaissance work has been particularly daring and successful owing to the pluck and determination with which he has faced bad weather and attacks from hostile aircraft in order to obtain his information. He has taken part in 10 successful bomb raids, and his keenness on all occasions has set a splendid example to others.

Lt. (Temp. Capt.) Geoffrey Hilton Bowman, R. War. R., Spec. Res. and R.F.C.

He had taken part in many offensive patrols, which he led on twenty occasions, in the course of which four enemy aircraft were destroyed and twelve others were driven down out of control. Although outnumbered by five to one on one occasion he handled his patrol of four machines with such skill and gallantry that after a very severe fight he was able to withdraw them without loss, having destroyed at least two enemy machines and driven down one out of control. His fearlessnesss and fine offensive spirit have been a splendid example to others.

Sec. Lt. (Temp. Capt.) Keith Logan Caldwell, R.F.C., Spec. Res.

For conspicuous gallantry and devotion to duty when leading offensive patrols. On one occasion he led a patrol of five machines against 12 hostile aircraft, all of which he drove down out of control. He has personally destroyed five hostile machines and has had over 50 contests in the air, in all of which he has displayed splendid skill and fearlessness, and has set an excellent example to his squadron.

Sec. Lt. William Charles Cambray, R.F.C.

For conspicuous gallantry and devotion to duty whilst acting as observer to offensive patrols. On four occasions at least he has shot down enemy scouts, and has also had numerous indecisive combats, in all of which he has displayed the greatest gallantry.

Sec. Lt. (Temp. Capt.) Alfred John Michell Clarke, Glouc. R., and R.F.C.

He has led 14 bomb raids, the majority of them against distant objectives, and his gallantry and skill have inspired the greatest confidence. Although continually heavily attacked by enemy aircraft, he has successfully inflicted considerable damage upon his opponents, as well as upon his objectives.

Sec. Lt. (Temp. Capt.) Arthur Coningham, R.F.C., Spec. Res.

For conspicuous gallantry and devotion to duty in attacking enemy aircraft. On numerous occasions he has displayed great dash and fine offensive spirit in engaging the enemy at close range, and driving them down completely out of control.

Sec. Lt. John Clive Currie, R.F.A., Spec. Res., attd. R.F.C.

For conspicuous gallantry and devotion to duty when acting as observer to another officer. They faced a violent thunderstorm, accompanied by a gale of wind and blinding rain, which had compelled all other machines to return to their aerodromes or to make forced landings, in order to locate the position of our infantry in the front line. This they successfully did, having spent one and a half hours in the air under fearful conditions, and returned with an accurate and valuable report to headquarters.

Lt. (Temp. Capt.) Frank Fernihough, R.F.A. and R.F.C.

In artillery observation and patrol work he has continually distinguished himself by his fearlessness and determination to gain information, undeterred by hostile fire or adverse weather conditions, remaining unshaken through some very trying experiences, during one of which his machine was very badly hit and his observer's leg was shot away. He has furnished information of the greatest value on numerous occasions.

Sec. Lt. (Temp. Lt.) Arthur Willoughby Falls Glenny, A.S.C., and R.F.C.

For conspicuous gallantry and devotion to duty when in co-operation with artillery. By dint of great perseverance, skill, and very gallant flying he has accomplished splendid work under very difficult circumstances. On one occasion, during a gale of wind, he successfully ranged three of our heavy batteries upon an enemy battery, which was completely obliterated. He has consistently set a very fine example to his squadron.

Sec. Lt. (Temp. Capt.) Geoffrey Herbert Hooper, R.E., attd. R.F.C.

When leading a patrol of four machines he attacked 10 enemy aircraft: during the engagement five of them were destroyed, two by himself. He had previously led a very successful night bombing attack on an aerodrome, in unfavourable weather dropping bombs from a very low altitude, and doing a great amount of damage. He has invariably displayed great gallantry and skill when engaged in aerial combats.

Temp. Sec. Lt. Walter James Hodgson-Horrocks, Gen. List and R.F.C.

For conspicuous gallantry and devotion to duty as a balloon observer. Although under accurate hostile shell fire, he remained in observation in spite of both balloon and basket having been hit by shell splinters, locating the gun which was shelling him, and refusing to descend until darkness made observation impossible. A few moments after he had descended the balloon was brought down by a direct hit. He has always shown remarkable energy and determination whilst engaged in observing.

Sec. Lt. (Temp. Lt.) Campbell Alexander Hoy, R.F.C.

When acting as observer on offensive patrols, on four occasions he has shot down hostile scouts, displaying in every instance splendid determination and a very fine offensive spirit.

FROM THE COURT CIRCULAR.

Windsor Castle, Sept. 12th.

The following Officer had the honour of being received by His Majesty at Buckingham Palace, when the King invested him with the Insignia of Companion of the Order into which he was admitted.

The Distinguished Service Order.

Capt. John Larkin, King's Own Scottish Borderers, attd. R.F.C.

His Majesty then conferred decorations as follows :—

The Military Cross.

Maj. Charles Blount, R.F.C.
Capt. William Barclay, R.F.C.
Capt. Percy Worthington, R.F.C.
Lt. John Aldred, R.F.C.
Sec. Lt. James Tennant, Cameron Highlanders, attd. R.F.C.
Sec. Lt. Eric Wilson, R.F.C.

NAVAL.

The following appointments have been made in the Royal Naval Air Service :—

Sept. 12th.—Sqdn. Comdr.—C. D. Breese has been promoted to rank of Actg. Wing Comdr., Sept. 8th.

Temp. Lt. (R.N.V.R.).—F. Atkinson has been reappointed as Actg. Lt. Comdr., R.N.V.R., April 1st.

Sept. 14th.—Actg. Lt., R.N. (Flt. Sub-Lt.) M. McMaster promoted to Flt. Lt., with seniority August 15th.

Sept. 14th.—A temp. commn. as Lieut., R.N.V.R., has been granted to Mr. H. S. Slade, Sept. 8th.

Admiralty Communiqués.

Sept. 11th.—During the last few days, owing to unfavourable weather, operations by naval aircraft have been restricted.

In operations which have taken place, however, one enemy aircraft was shot down and another driven down out of control.

Bombs have been dropped on Houttave Aerodrome (about five miles north-west of Bruges), but owing to bad visibility results could not be observed.

All our machines have returned safely.

Sept. 12th.—During the last 24 hours many fighter patrols have been carried out by the Royal Naval Air Service.

One of these patrols engaged two enemy spotting machines, one being shot down, the machine crashing into the sea; the other landing almost intact in our lines. The pilot and observer of the latter machine were made prisoners.

Two other enemy machines were attacked and driven down during a sweep by our machines.

In conjunction with a bombing raid nine enemy machines were encountered, five of which are believed to have been driven down out of control.

Bombing raids were carried out by night on—

St. Denis Westrem aerodrome (south-west of Ghent).
Gontrode aerodrome (south-east of Ghent).
Bruges docks.

Thourout railway junction (about 11 miles east-north-east of Dixmude).

Railway objectives near Ghent.

Several tons of explosives were dropped.

During the forenoon of Sept. 11th a bombing raid was made on Sparappelhoek, Thourout aerodrome, and Engel (north-west of Thourout) ammunition dump. At Sparappelhoek bombs were observed to explode amongst the hangars, causing much smoke, and at Thourout a direct hit was observed on a hangar. At Engel ammunition dump a large fire was caused.

The bombing formation was attacked by enemy machines, and one of the latter was shot down smoking and out of control. Many tons of explosives were dropped

In all the operations referred to all machines and pilots returned safely.

Sept. 13th.—During the 11th and 12th inst., in spite of poor visibility, the following bombing raids by naval aircraft have been carried out :—

1. Thourout aerodrome and dumps, on which objectives several tons of bombs were dropped, and a heavy explosion was caused.

2. Bruges docks, where an explosion was also caused.

3. A further bombing raid was attempted on Bruges dock, but owing to thick clouds the shipping alongside Zeebrugge Mole was attacked instead. A direct hit was made on a large destroyer, and several direct hits on seaplane sheds and Mole, causing a fire.

All our machines returned safely.

Sept. 14th.—A bombing raid was carried out during the night of 12th-13th by the Royal Naval Air Service on the following military objectives :—

Ghistelles Aerodrome.

Thourout Aerodrome.

A large quantity of bombs was dropped.

All machines returned safely.

Sept. 17th.—Naval aircraft carried out a bombing raid on September 15th on enemy shipping between Ostend and Blankenberghe. Bombs were dropped on destroyers and trawlers or drifters.

One large destroyer was hit amidships and one, probably two, out of a group of four trawlers, was sunk.

In the evening during a late patrol one of our seaplanes was attacked by two seaplanes, which were engaged by our escorting aeroplanes and one shot down in flames, the other being chased towards some enemy destroyers.

At about 10 a.m. yesterday (September 16th) a patrol engaged a formation of enemy aircraft, destroying one and probably a second.

The Casualty List.

Reported Sept. 13th.

Missing.—Adlam, Flt. Sub-Lt. L. A., R.N.

Killed Accidentally.—Blackstock, C. R., Aircftmn., 2nd Gr., F22904.

Reported Sept. 17th.

Killed.—Wood, Flt. Comdr. C. E., R.N.

Benjamin, Lt. J. D., R.N.R.

Accidentally Killed.—Bettington, Actg. Sqdn. Comdr. A. F., R.N.

Missing, feared Lost.—Cripps, Flt. Sub-Lt. J. W. D., R.N.

Missing.—Wilford, Flt. Sub-Lt. J. R., R.N.

Abbott, Flt. Sub-Lt. E. D., R.N.

Accidentally Injured.—de Ville, Actg. Flt. Comdr. E. A. de L., R.N.

Lavington, Flt. Sub-Lt. G. W., R.N.

Cole, Flt. Sub-Lt. J. A., R.N.

Wood, Proby, Flt. Officer K. S., R.N.

Lester, Proby. Flt. Officer H. L. P., R.N.

Slightly Injured.—Ball, Flt. Sub-Lt. R. N., R.N.

Previously reported Missing, now reported Prisoner.—Austen, Flt. Sub-Lt. V. G., R.N.

Reported Sept. 18th.

Accidentally Killed.—Bishop, Flt. Sub-Lt. A. A., R.N.

Previously reported Missing, now presumed to have been Killed.—Bridge, Flt. Sub-Lt. B. H., R.N.

PERSONAL NOTICES.

Deaths.

BETTINGTON.—Sqdn. Comdr. Aylmer Fitzwarine Bettington, R.N.A.S., who was killed whilst flying on Sept. 12th, was the youngest son of Colonel and Mrs. Bettington of Johannesburg.

Sqdn. Comdr. Bettington's eldest brother, Claude, an officer of the Royal Artillery, was killed in 1912 in an accident at Oxford, with Lt. Hotchkiss, R.F.C. His elder brother, Lt.-Col. Vere Bettington, is in command of an R.F.C. Wing. To his family all will offer the deepest sympathy.

One who knew Sqdn. Comdr. Bettington well, writes :—

"Whom the gods love die young. And assuredly the gods loved Aylmer Bettington. And he died young. Here was the perfect embodiment of all that is summed up in the one glorious word, 'Youth.' Beneath his splendid frame beat the greatest of hearts. No endeavour was too high for him, no risk too great, no duty or sport not worth doing, and not worth doing well.

"To see him leading a Rugger pack with the same priceless skill, dash and pluck with which he handled an aeroplane, to hear his laugh in the mess or on the tennis court, to see with what enthusiasm he did his job, was to learn the true meaning of Love of Life.

"He has gone too soon. Young men such as he, with their high hearts, and simple, joyous, direct natures can ill be spared by the nation in times like these. And we who but yesterday had worked, played and jested with him have now but the loving memory of him. We, too, are poorer by his loss, but we are richer for having known him. Dear old Bett. May he rest in peace!"

BISHOP.—Flt. Sub-Lieut. Arthur A. Bishop, R.N., was killed on Sept. 14th, his machine nose-diving from a great height and crashing on the rocks off the Kent Coast.

DAWSON.—At an inquest held at Middlesbrough on Sept. 11th on the body of Prob. Flt. Officer John Marshall Dawson, R.N., whose death was announced last week, a verdict of accidental death was returned. He had had three hours' flying on dual control machines, and was then flying alone. In the fatal flight the machine nose-dived and then turned onto its back. The pressure on the wings caused them to break, and the machine fell in a mass to the ground.

POOFCESO.—A verdict of death from misadventure was returned at an inquest on Sept. 12th on Prob. Flt. Officer Alles Sangty Poofceso, R.N., whose machine fell into Chingford Reservoir. He was drowned before assistance arrived.

REEVES.—Flt. Lieut. Fabian Pember Reeves, R.N., who was reported missing on June 6th last, is now officially reported killed on that date. He was the only son of Mr. William Pember Reeves and Mrs. Reeves, of 43, Cornwall Gardens, S.W., and grandson of Mr. William Reeves, of Christchurch, New Zealand.

A semi-official account of the sinking of sundry German submarines, published on Sept. 15th, contained the following :—

A seaplane attacked an enemy submarine, which she had observed apparently manœuvring into position to fire a torpedo at a passing merchant ship. Before the seaplane arrived over the submarine the latter submerged, but three bombs were dropped on the position where he had disappeared from sight. In five minutes' time a large upheaval was noticed where the bombs had been dropped; this could best be compared to a huge bubble, rising some distance above the level of the sea, and distinctly visible for a minute or more. There was no further sign of the submarine.

MILITARY.

G.H.Q. Communiqués.

Sept. 11th, 9.15 p.m.—On the 10th inst clouds and thick haze again prevailed and made (? air) work difficult. In spite of this observation was carried out for our artillery both by our aeroplanes and our balloons.

During the day our machines bombed two enemy aerodromes near Cambrai and rest billets near Douai, and during the night of the 10th-11th inst. dropped bombs on an aerodrome and searchlights near Courtrai.

In air fighting yesterday three German aeroplanes were brought down and seven others were driven down out of control. Of these two were brought down and one driven down by one pilot.

In one case this pilot descended to within 50 ft. of the ground and set fire to the machine he had brought down. He then regained our side of the line still flying at 50 ft., although attacked by three hostile machines.

Three of our machines are missing.

Sept. 12th, 9.10 p.m.—After midday on the 11th inst. the bad visibility of the morning improved and aerial activity became great. Very successful artillery and photographic work was carried on continuously.

During the day 281 bombs were dropped on various targets, including two aerodromes south of Lille and two aerodromes and a large ammunition dump in the vicinity of Roulers. During the night 89 bombs were dropped on railway stations, ammunition dumps, and trains in the Courtrai area, making a total weight of over six tons during the 24 hours.

Fighting was very vigorous and strong formations of enemy scouts were encountered by our patrols. Artillery and photographic machines working well over the enemy's country were also frequently engaged.

Seven hostile machines were brought down in combat and 12 were driven down out of control; in addition one German machine was shot down by our anti-aircraft guns.

Eight of our aeroplanes are missing.

Sept. 13th, 9.15 p.m.—In spite of bad visibility some artillery work was carried out by our aeroplanes yesterday, and photographs were taken.

Bombing of the enemy's aerodromes, ammunition dumps, and railway stations was continued by day and night.

Three enemy machines were driven down out of control.

(*Continued on page* 833.)

AERONAUTICAL ENGINEERING

SUPPLEMENT TO "THE AEROPLANE"

INCORPORATING AIRCRAFT ENGINEERING, AERODYNAMICS, AND MATTERS PERTAINING TO THE AERONAUTICAL ENGINEER AND THE AIRCRAFT TRADER

The Production of Aeroplanes and their Components

(Thirteenth Instalment.)

BY STEPNEY BLAKENEY.

Elevators.

The elevators which are attached to the tail plane should now be put in hand. As they are of similar construction, the only difference being the shape and size, it will be unnecessary to describe their construction in detail. This also applies to the rudder and fin.

Control Levers.

The levers on the elevators and rudder we will assume, firstly, are made of mild steel stampings. That being the case, they must be sent into the metal machine shop to be bored out to fit onto the steel tubing. This can be done by either "chucking" them in a chuck in a lathe, or fixing in a drilling jig and drilling ¼-in. below size and finishing with the correct sized reamer.

These levers, however, may be made of hollow sheet steel, in which case they will be edge-welded, with stiffening pieces at the ends for attaching the "D" shackles attached to the control cables. And a steel boss will be riveted to the centre for attaching them to the steel tube, to be drilled and pinned thereon.

In this case a considerable amount of work is in hand, and a certain amount of experimental work is necessary. The drawings should be carefully studied. Assuming these levers to be of streamline section, the first thing to do will be to get the pattern-maker to make a wooden pattern for a former, on which will be bent and formed one-half of the lever, which we can assume to be made out of 20-gauge sheet steel. The former should be made, both male and female, so that the sheet steel can be planed out and afterwards finished to shape by pressing, or squeezing, against the cast-iron former.

After the sheets have been made correctly to shape, they can then have the hollow bosses attached to them by means of rivets and brazing, the whole being assembled for this purpose on a mandril.

The hollow bosses are of about 14-gauge sheet steel, and are generally "spinnings." These being an extremely difficult thing to make, it is best to obtain them from certain firms who make a speciality of this class of work, as they would be too costly to make, not to say unsatisfactory, except in the hands of skilled metal spinners equipped with the necessary tools.

Fixing the Levers.

The levers which have just been described are required for the rudder and the elevators. They are attached to the steel tube framing of the rudder and elevators by means of taper pins, which are carefully put through the bosses of the levers and the steel tube and riveted over. After this, the whole is carefully sweated together with solder. This solder must be the best tinman's solder, for it forms the strongest joint, and flows more evenly and neatly than plumber's solder into the small crevices and openings. Any superfluous solder should be cleaned off with a rag or small scraper or fine file while still hot.

Tail-skid Fittings.

The various component parts of the rear skid will next have to be considered, and we can here deal with the most important of them.

The skid-fork will probably be a mild steel stamping. This requires to be machined up with considerable accuracy and precision to fine limits. To proceed with the work, it will be best to have the socket-end turned down in a centre lathe, as it will serve as a gripping piece for the jig, which will have to be made to hold the skid-fork whilst it is going through the operation of being milled.

For this purpose it must be sent to the marker-off and be centred. It can then be sent to the metal machine shop, where it will be placed between the centres of a small lathe, say a 6 in. centre engine lathe. Here the outside will be turned down to the dimensions shown on the drawing.

Milling Operations.

After this, the stamping will be sent to the milling machine to have the fork-ends milled. For the purpose of holding the stamping, a heavy cast-iron jig had better be made, or a mild steel clamping jig (see Fig. 18), which holds the socket-end firmly, whilst the fork-ends project upwards. Possibly it may be advantageous to mill about three fork-ends at once, and the jig can be made accordingly if desired.

The next thing to do is to set up the milling cutters on the spindle of the milling machine. These will be "side and face" cutters, which means that they are capable of cutting on the flat face at the side as well as on the circumference.

They can be set up so that they mill the outside faces of the fork, and so there will, of course, be a fixed overall dimension. The distance apart of the cutters must be maintained by collars placed between the cutters on the spindle, and well tightened up to prevent the cutters from slipping when the machine commences to cut.

These two cutters will clean up the faces of the forks, after which the cutters can be replaced with another couple of cutters to finish the inside of the fork. Or, if the stock of milling cutters happens to be extensive, possibly one of the right width can be found which will guarantee the accuracy of the width of the cut.

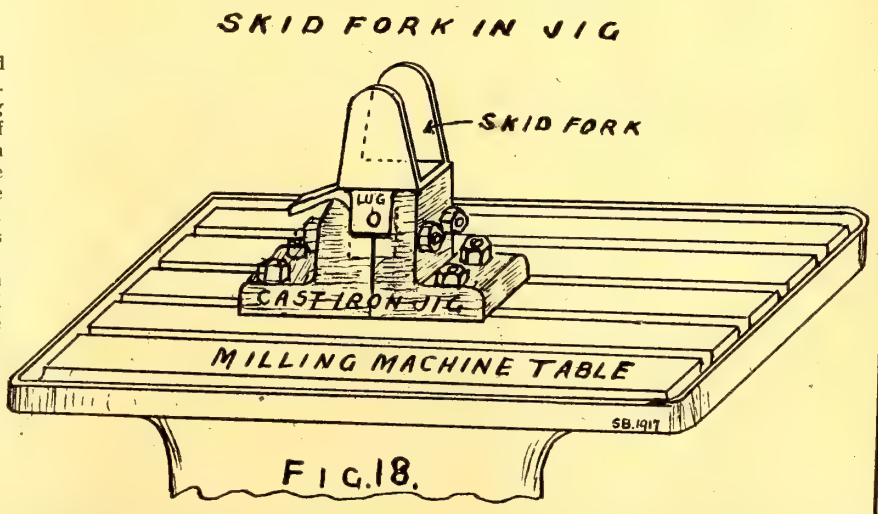


FIG. 18.

Edge Finishing.

The next thing will be to finish the edges of the fork. These can be done in the vice, with a file, by the fitters, but, of course, the whole of the work can be done on the milling machine, if the stock of milling cutters is sufficiently extensive. In this case another jig must be available for supporting and gripping the fork-ends whilst the edges are being milled and the top of the forks rounded to the true curvation. Naturally, this method is preferable, as accuracy is guaranteed, but this could only be done in a shop with a fair-sized machine-tool plant, unless time was no object.

Drilling the Fork-ends.

The operation of milling having been completed, a drilling jig must be made for drilling the holes in the fork-ends for the skid-bolt to pass through.

Boring the Socket.

Having completed these operations, the next thing to do will be to prepare a cast-iron boring jig which will grip the socket end of the fork whilst it is being bored out. This jig can be made either to bolt onto the face-plate of the lathe or to be stood on the table of a large drilling machine, whichever is available for this work, so that in the case of a small machine shop, no undue inconvenience may be caused (see Fig. 19).

The boring-out having been completed, the skid-fork may now be considered ready to be sent to the inspection department. They should easily pass through here, as most of the operations are machine work, and, with the male and female gauges to check dimensions, accuracy should be assured.

Skid-stay Forks.

The next items are the forks for skid-stay, or stay-tube sockets, as some people call them. These articles, though simple to look at, are not exactly easy to make, and may cause a considerable amount of trouble and scrap if not manufactured in the right way.

For this purpose they will be made out of solid steel bar, turned out to profile on a capstan or turret lathe. This operation consists of turning down the socket-end to the taper shown on the design, and boring the fork-end to the profile, the socket leaving the lathe with the fork-end solid. This will have to be cut out on a milling machine, and here the trouble commences unless a good jig is made which will hold the socket-end firmly whilst the fork is being milled out.

The jig for this purpose should consist of a mechanism which will grip the taper of the socket firmly. For this purpose make a strong grip-jig, something on the lines of a machine vice, or similar to Fig. 18, only with special jaws. This will enable about three or four sockets to be done at once, all being placed in the jig in a line. In this way fairly quick production becomes possible immediately. The drilling of the A.G.S. pin-hole in the fork-end will necessitate a drilling jig, which can be built up of mild steel, or cast-iron, whichever is most readily obtained.

The Skid Fitting.

The steel-clip fitting for attaching the stay tube to the fuselage is made of two pieces of 16-gauge sheet steel, each bent to fit the longeron and also to form the lug to which is attached the stay tube. The edges of the two pieces forming the lug are brazed together, with the addition of a small washer on either side, the hole afterwards being reamered out. The object of the washers is to increase the bearing area for the attachment bolt which passes through. On the inside face of the fitting is a steel socket, into which the cross tube is fitted. This socket is welded on, and into this is fitted the cross tube which forms the support for the bearing for the skid post.

Strut-end Fittings.

It will be noticed that at the end of interplane struts, which in many types of machines are made of spruce, a steel fitting in the form of a streamline band or ferrule passes round the strut end. Into this is fitted an aluminium packing piece, which fits onto and forms the connection between the eyebolts, which pass through each spar, front and rear. This packing piece, with the band, keeps the struts into position and takes the thrust.

This streamline band is formed of about 20-gauge sheet steel in one piece, the two edges at the rear or thin end of the streamline being butted together and welded. This welding must be well done and neat, as no filing nor cleaning up of welded joints is permissible. Afterwards it must be well annealed.

Making Strut Sockets

The best way of making these strut sockets is to have a cast-iron former cast, the pattern being equal in length to about 9 inches of the spruce strut at each end. This being cast, it must be carefully cleaned up, and then it is ready for the sheet steel blank, which is to form the strut socket, to be bent onto it and round it.

Before cutting up sheet steel, it is as well to get a piece of zinc, or thin common black iron, or tin, and bend it round and cut it until the required shape and pattern is obtained, after which it can be flattened out and used as a template for marking off the actual blanks. It may be as well to point out, however, that the outer extremities of the socket should be left quite full, and more or less shapeless, as in actual practice it is found to be safer to finish off the final shaping after the welding is complete, in case of any twist or deformation having occurred during welding, as is not infrequent. Also, the ends require to be trimmed with a file to suit the aluminium packing pieces.

This being done, the bolt and pin-holes will be carefully set out and marked off ready for drilling, and drilled. After which the fittings can be considered finished and can be sent to the inspection department. When finished with here, it will be sent to the wood-components department to be fitted to the struts.

Packing Pieces.

The aluminium packing pieces which fit into the strut sockets are generally made off metal patterns, and the castings usually obtained are nearly perfect. Thus they require very little cleaning up. The only machining to be done consists in drilling the bolt-hole and milling out the radius slot where the eye-bolt fits into the packing piece.

This work is usually done in a small milling machine with a milling cutter of the required diameter.

In assembling the strut ferrules and packing pieces onto the strut ends, care must be taken to see, and make sure, that the aluminium packing piece beds onto the spruce strut. Unless it does so, it is possible that the strut may not do its work, and might be the cause of a failure of the whole machine.

Small Clips.

It frequently happens in a large contract that amongst the many items called for are small clips. These clips may be pipe clips or wire clips. Sometimes the clip is semi-circular, sometimes square, in fact, they are all shapes and sizes, but each clip of any certain type or size must naturally be strictly to dimensions and limits. The gauge of the metal used in their manufacture is often very thin. When this is the case it frequently happens that it is possible for this work to be done by girls.

To enable girls to manufacture these clips, and save the expense of making costly press tools which take a considerable time to make and also to save using presses on work they need not be employed on, it is best to make a few simple jigs which can be used in the bench vice, and the power obtained from the use of an ordinary hammer, or the squeezing action of the vice.

Clip Jigs.

Assuming that we require a thousand clips to clip ⅜-in. copper petrol pipes, the best thing to do is to get two pieces of steel, exactly equal in thickness to the required width of the clips, each we can say for our purpose about 3 in. long by an inch wide. File them flat and square all ways, then on one mark out your

JIG FOR BOREING SKID FORK SOCKET.

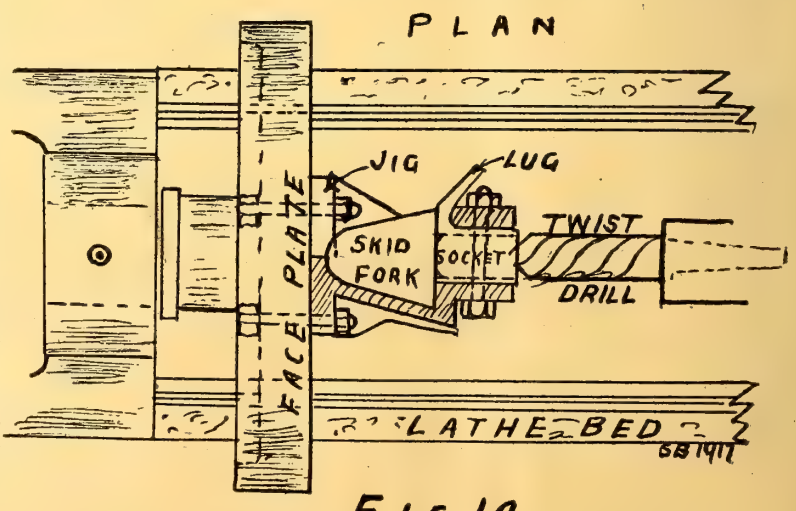


FIG. 19

clip, and file this up to form a female gauge of the pipe clip, only leaving it the same thickness as the required width of the clip. After this file up the other piece to form a male gauge corresponding to the other piece forming the female gauge.

When these are complete, put them both together and mark off half the thickness of the gauge of metal on each one, file this off, and you have a male and female gauge to suit each side of the desired clips. These then form the die and the punch for making the clips.

The next thing to be done will be to fit a couple of pins into the ends of each end of the male portion, and then drill holes in a corresponding position in the female portion for them to slip into. This being complete, all that remains to be done is to cut off strips of the metal to be used, a shade wider than required, and cut off into suitable lengths, equal to the total length of the clip when flattened, plus a small amount, which must be the same in every case.

Clip Production.

Having got so far, it may be possible to start production.

The first thing to do will be firmly to grip the female portion of the jig in the vice, with the clip side uppermost, then drop the other half of the jig onto it, lift slightly, and slide a piece of metal between the two and accurately locate it in the middle, a few taps of the hammer and the clip will be found to be practically shaped up. The next thing to be done is to drill the holes in the clip for the attachment screws.

The same jig can be made to act as a drilling jig. For this purpose drill the two holes through the jig in the required position. These holes will, of course, pass through the first clip, and all others can be drilled the same way, after which the surplus metal may be filed off and the clip will be complete.

This method is a simple but effective way of producing small clips quickly and accurately, and can, of course, be elaborated if desired. Also the jigs being simple of construction, two or three can be made quickly, or any jig worn out can be replaced. Also it enables girl labour to be utilised, providing the gauge of the metal used is not thicker than 18 gauge.

Engine Plates.

The production of the front and back engine plates by hand is a job that should only be put into the hands of an experienced sheet-metal worker, as the gauge of these being about 10-gauge which equals 0.128 of an inch makes it a fairly tough job. However, it can be done, and is done, but it is not like shelling peas.

The back engine plate, we will assume, is of rectangular shape, the edges and lightening holes all being flanged at right angles to stiffen the plate. Therefore, in marking off the plate on the sheet, all necessary allowances must be made for the flange and bends. This can be easily done first before actually cutting out the engine plate, in the following manner.

We can assume that the edge of the plate, which forms the top and bottom flange, when in position, is about $\frac{1}{2}$-in. wide, with 3/16-in. radius. Therefore, take a piece of steel plate, 10-gauge in thickness, say 5 in. long by 3 in. wide, and mark off a $\frac{1}{2}$-in. flange either end, and then put it in the vice with a piece of bar steel having a 3/16-in. radius, and hammer the steel plate with a mallet over this flanging jig.

When this has been done at both ends and a $\frac{1}{2}$-in. flange accurately formed, having a 3/16-in. radius, take the piece of steel out of the vice and measure it over all, and find out if it measures 4 in. across the two flanges, or if it is more or less, and accordingly make your necessary calculations and allowances. Doing this will enable you to cut out the plate to the dimensions required, to give you enough material to work with, to enable you to produce the engine plate to the precise required dimensions.

In cutting out and flanging the lightening holes had better be started and finished first, as any buckle or distortion can be eliminated in the plate before the important hole for the engine attachment is cut out.

Before commencing to work on the plate it is as well to anneal it thoroughly, according to the instructions laid down for annealing steel plates, after which the lightening holes should be carefully set out. Take care to leave enough metal for flanging, plus a margin for cleaning up, after flanging.

All flanging should as far as possible be done with hard wood mallets, to prevent the metal from being thinned down and the surface damaged.

(To be continued.)

GERMAN AEROPLANE PRODUCTION.—A photograph of the wing assembling work in the Albatros Factory. Fabric strips are being strung onto the ribs to make a lining between the rib and the doped fabric on top. It may be noticed that the workers do not show any noticeable signs of starvation, despite the stories of which we hear so much.

AEROPLANE PRODUCTION CRITICISM.

The following letter has been received:—

Sir,—As an interested reader of Mr. Stepney Blakeney's article, "The Production of Aeroplanes and their Components," and as one concerned with the production of them in quantities, may I be permitted to remark upon the paragraph appearing under the heading "Wiring Plates," August 15th, ninth instalment?

The author there states: "make templets," "mark out sheet to same," "cut out on jig saw," "and file to shape." "By this means a large number of components can be quickly put through the works." In the writer's experience, drilling holes around the marked-out part is far more rapid than the jig-saw method of cutting out.

Hand production of parts seems, however, only practical when making one or two experimental machines, and if handling a contract for several hundred machines, with the Air Board constantly pressing for delivery, more rapid methods of manufacture must be considered.

The writer would put forward the following practice, bearing in mind the cry "more aeroplanes—quickly":—

Taking the case of a concern three parts through a contract, and preparing to take up the manufacture of a new type of machine, the tool designer, if smart, will standardise press tools and drilling jigs in a range of sizes.

The tool-room, at this time rather short of work, will machine and fit these in readiness for the time when the drawings come to hand. A good stock of drill bushes will also be made in all sizes.

In the case of blanking tools, the dies will be made in two sections, fitted to a bolster with all screws and dowels. As soon as the drawings are available the tool-room will get to work on templets of all plate-work parts. These will be sent direct to the A.I.D. for acceptance.

These proving satisfactory, will be used to lay out press tools, and also to gauge same in manufacture. A suitable size of die being selected from stock, it is marked out to templet, removed from the bolster, and being in two sections, divided along the centre-line of the job, can be almost finished on the milling machine with a minimum of hand work.

By the time the shops are ready for them, nearly all the blankings will have been made.

The drill jigs can be started on as soon as blankings are available. A blanking would be located with gauge plates cut by its own press tool, while it is not a long job to bore for bushes, these being taken from stock.

All plate-work parts would be drilled flat and well annealed before bending on former blocks under the press.

These standard tools being quickly disposed of, the tool-room would turn its attention to special jigs and fixtures.

The writer's experience is that a large and well-equipped tool-room pays.

(Signed) C. J. Francis.

Mr. Blakeney's Reply.

Sir,—In reply to the comments of Mr. C. J. Francis of my article in your issue of August 15th, I note that he is in favour of drilling holes around any sheet metal part he is making for the purpose of detaching the metal part in the rough from the large plate, his reason being that it is more rapid. I beg to say that I tried this method some considerable time ago, and gave it up, as being thoroughly unsatisfactory.

My reasons were that in addition to having to mark off the plate in its outline, you again had to mark off the holes for drilling, unless you cared to risk the drill cutting into the scriber line, or being too far away. Also after the drilling is completed, it is necessary to cut out the metal part required from the sheet, either with a hack-saw or a small chisel, and after this has been done the sheet metal worker is confronted with a thoroughly rough ragged-edged piece of metal to file up, with a far larger bulk or mass of metal to remove than would be the case if cut out by an experienced jig-saw operator. Such operators are in most cases fully capable of sawing a piece of metal out, almost dead onto a scriber line. Also the excessive wear and tear of the teeth of a file on these ragged edges is enormous, thus further adding to the cost of production.

I quite agree, that the making by hand of sheet metal parts is slow, and if I were carrying out a contract for several hundred machines, as mentioned by Mr. Francis, I should most certainly do them under a power press, and have done so with contracts for less quantities. I must, however, ask Mr. Frances to refer back to my article in the 8th August issue, wherein I most specifically mention that "as we have only a small order, etc., etc., it will be useless to consider making dies and punches, etc."

With regard to the remarks and suggestions of Mr. Francis, that "the tool designer, if smart, will standardise press tools and drilling jigs, etc." May I ask him how he proposes to standardise the press tools, etc., for work for which he has not yet, as he states himself, received the drawings? It seems to me that such a procedure would be likely to cause his firm considerable, not to say unnecessary, expense.

With regard to blanking dies, these frequently take nearly a fortnight to make before they can be used for any production, and by that time the erecting shop would be waiting for the metal parts, which could have been put in hand in a small quantity during the time occupied in waiting for the press tools. Thus hand-work would expedite delivery and erection instead of the works producing nothing for a fortnight.

I quite agree that a large and well-equipped tool room does pay, but there are very many firms who have not got one and could not afford one, and if they could, probably could not get the equipment.

I would also like to point out that these articles are not dealing with very large engineering concerns, but small ones, employing moderate capital and a small number of hands.

I was pleased to receive Mr. Francis's comments, and hope you will find space to publish same.—S. B.

[Criticisms of Mr. Blakeney's articles are always welcome, but those who feel disposed to criticise are asked to remember that these articles are only intended for the education of the young and of new-comers to the Aircraft Industry. They are, therefore, of a purely elementary character and only profess to give a general idea of how a fairly modern aeroplane of conventional design is built. Anything calculated to be highly instructive to managers or foremen of first-class aircraft factories would naturally be of at least equal value to the enemy, and it would therefore be contrary to the interests of this country to publish such descriptions.—Ed.]

IGNITION CABLES.

A very considerable part of the business conducted by Messrs. E. Kalker and Co., of Coventry—who have made a speciality of all types of cables and flexibles for the motor trade generally, since the first cars were made in this country—is centred in the special cables they supply for aero-engines made to the specifications of the Aeronautical Inspection Department.

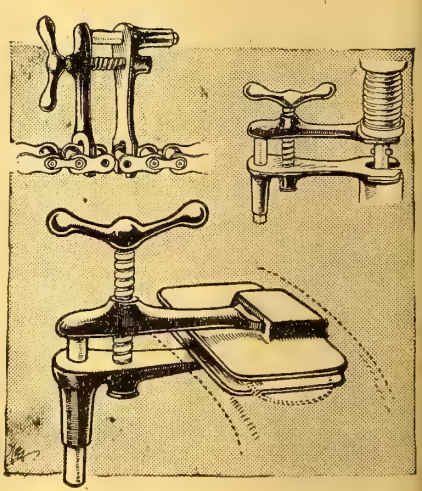
These cables, particularly their IIIA Special Magneto Cable, are of such a uniform high quality that not an inch has ever been rejected by the Government inspectors out of the many hundreds of miles supplied by Kalker and Co. for this class of work. The same remark applies to the ignition cables supplied to the Government for the Tanks and W.O. lorries.

The firm has a high reputation for armoured lighting cables in single, twin or triple core, brass and aluminium strip armoured, and they are also specialists in making up cables for electric starters of motor-cars, armoured or braided.

OF USE TO MOTORISTS.

Brown Bros., Ltd., of Great Eastern Street, are well known to the aircraft industry as suppliers and manufacturers of many aircraft components and accessories. They have a still greater clientele among the motoring classes, and as practically everyone concerned with aviation is interested directly or indirectly with the care of some motor vehicle—from a two-stroke motor-cycle to a ten-ton lorry—one need not apologise for alluding to articles not directly connected with aircraft.

A speciality of Brown Bros.' motor department is the Duco Leaf-Spring Gaiter for totally enclosing motor-car springs, as a protection from dirt and water. The springs are thoroughly greased between their leaves, mopped all over with grease, and the gaiters are fitted. Thus the springs work under ideal conditions of lubrication, with a consequent increase in life, and an improved maintenance of comfort, a point of importance where motor ambulances are concerned. It need hardly be added that well-greased and efficient springs add life to the engine, transmission, and tyres of any car working under the stress of war conditions. A measurement form may be obtained upon application.



An ingenious accessory, which has also been placed upon the market by Brown Bros., is the combined valve spring-lifter, tyre patch holder, and chain pulley, illustrated.

The sketches explain themselves, and one need only add that the device is a distinct asset in a tool kit, as it performs three functions, which one cannot always achieve with unsuitable instruments. The device is sold in motor-cycle and car sizes.

MARKET REPORTS.

Prices given are for quantities on usual terms.

Sept. 13th, 1917.

COPPER.—There is naturally very little interest shown in the market here. The official prices continue unchanged and supplies are satisfactory. It is rumoured that the U.S.A. War Industries Board have agreed that 22½ cents per lb. will be the price advanced to producers. If this is correct, it should create satisfaction among producers. However, nothing official has been issued, and in the meantime buyers are being forced into the market owing to the depletion of their stocks.

Current Prices.

Copper Ingot, Standard	£120 per ton, Cash
Copper Sheet	£160 per ton.
Copper Tube, S.D.	19¾d. per lb.
Brass Sheet, 24 Gauge	15⅞d. per lb.
Brass Tubes, S.D.	16½d. per lb

TIN.—The Tin market still shows signs of an unsettled condition, and in consequence prices continue to fluctuate. It is, in fact, very difficult to foresee what will happen, although it is not expected that there will be any further appreciable decline in the price.

The output of Tin is fairly satisfactory, and supplies are being maintained.

Comparative Prices.

To-day			
Sept. 10th	£241	0	0
Sept. 6th	240	15	0
Sept. 4th	241	15	0
August 10th	244	5	0
Highest Price, 1916	205	0	0

LEAD.—A detailed order, issued by the Ministry of Munitions, gives them complete control of the whole of the Lead supply of the United Kingdom.

The order is briefly detailed below, also the official prices, which continue unchanged.

Communications on the subject of remelted, old or scrap Lead, or Lead residues, should be addressed to the Director of Materials, A.M., 2/E.S., Hotel Victoria, Northumberland Avenue, W.C., marked "Scrap Lead." All applications for licences to purchase Lead or other than remelted, old or Lead residues, to the Director of Materials, A.M., 2/E., at the same address, marked "Lead Licence," and all applications to use Lead, other than remelted, old or scrap Lead, or Lead residues, to the Controller, Priority Department, Caxton Street, Westminster. It should be understood that the Order, dated April 6th, 1917, relating to certain classes of Lead, is cancelled, except for Clause 8, but this cancellation does not affect the previous operation of that Order nor the validity of any action taken thereunder.

THE ORDER.—The Ministry of Munitions takes possession as from September 1st of all Pig Lead, whether virgin or remelted. old and scrap Lead, and Lead residues, excepting such Lead as may be in the possession of or under an existing lawful contract, in writing, for future delivery to a manufacturer for use in the manufacturer's own works, and Lead as may be specially excepted under written authority.

The Lead of which possession is taken will be paid for on delivery; as to virgin Pig Lead, at the prices specified hereunder; and as to remelted, old and scrap Lead, and Lead residues, upon terms which will be communicated in due course to the various owners.

All existing licences for dealing in any Lead are cancelled, and no persons shall, as from September 1st, purchase, sell, offer to purchase or sell, or, except for the purpose of carrying out a contract in writing existing prior to April 6th, 1917; for the sale or purchase of White Lead, Lead oxides, Lead manufactures, Lead alloys, or Lead compounds, of any kind, or a contract in writing existing prior to February 2nd, 1917; for the sale or purchase of any kind of Lead, enter into any transaction or negotiation, in relation to the sale, or purchase of Lead situated outside the United Kingdom, except under and in accordance with the terms of a licence issued under the authority of the Ministry of Munitions. Further, no person shall offer to purchase or take delivery of any Lead situated in the United Kingdom, except under and in accordance with the terms of a licence issued under the authority of the Ministry of Munitions, or offer to sell, sell, supply, or deliver any such Lead to any person other than the holder of such a licence.

No purchase or sale of Lead situated in the United Kingdom shall be at a price exceeding that given below, and no person must use Lead for the purpose of any manufacture or work, except for the purpose of a contract for the time being in existence, or order certified to be within Class "A," or certificate by or on behalf of the Ministry of Munitions to be within Class "B," or for the purpose of necessary repairs or renewals where the use is not exceeding one cwt. of Sheet Lead or Lead Pipe, and not exceeding 28 lbs. of Solder and no other Lead is involved, or for the purpose of Pipe Casting from Metal already in the form of Pipe on February 2nd, 1917, or from Lead purchased for that purpose prior to that date, or under licence.

Return of Stocks are to be made monthly, giving stocks, purchases, lead delivered, etc., but where stocks, etc., do not exceed one cwt., no returns are necessary.

Official Prices.

Virgin Pig Lead	£29 per ton, c.i.f.
Virgin Pig Lead	£30 per ton. Ex Stores

Manufactured Lead.

Sheet Lead	£39 10s. per ton, delvd. U.K.
Lead Pipe	£40 per ton, delvd. U.K., less 2½ per cent., M/A.

Lead Compounds.

Dry White Lead	£46 per ton, delvd. U.K., less 5 per cent., M/A.
White Lead in Oil	£53 per ton, less 5 per cent. for over 5 cwt. lots.
White Lead in Oil	£55 per ton, less 5 per cent. for under 5 cwt. lots.
Red Lead	£42 per ton, less 2½ per cent., M/A.

The White Lead prices are subject to revision, should the price of Linseed Oil fluctuate above or below the average spot price of £50 per ton.

STEEL.—In certain quarters there is a feeling that the output of Aircraft Steels is all that is required; although tremendous efforts have and are being made to effect an enormous increase in the output of the various Steels, one is inclined to think that it will be a few months yet before the output will overtake the present and ever growing demand. The chief concern at present is Cast Steel. This has been brought about by the Swedish crisis. It has, of course, been generally known that we were not receiving a fair proportion of the available supplies of Swedish Ore, and the present crisis is being keenly watched by Cast Steel makers. The situation is very serious indeed, and the Cast Steel problem is likely to give the authorities very grave concern. Prices continue unchanged, although the Director of Steel Supplies has not yet notified constructors of the prices they will be charged for material supplied to them by the Air Board.

R.A.F. 3B Steel (Black or Blue Reeled)	78s. to 80s.
R.A.F. 1E Steel ,, ,,	36s. to 40s.
R.A.F. 9A Sheet Steel, 30s. to 32s. per cwt.	

ALUMINIUM.—Supplies of this material are quite satisfactory, and the official prices remain unchanged.

Ingot	£225
Remelted	210

TIMBER.—The Timber situation is still very acute, and unfortunately there are no signs of a satisfactory solution. One hears that experiments are being made with woods with the object of finding a substitute for Silver Spruce, but nothing satisfactory appears to have been discovered. Prices continue to soar to an abnormal height, and, as a matter of fact, it is impossible to obtain supplies of Silver Spruce at any price. Small supplies of Walnut and Mahogany continue to leak through, but firms who have a demand for Softwoods are experiencing great difficulty in procuring the timber.

Current Average Prices.

Silver Spruce,	17s. 9d., c.f.
English Ash,	13s. 6d. to 15s., c.f.
Walnut,	2s. 3d. to 2s. 6d., s.f.
Mahogany,	2s. 2d. to 2s. 4d., s.f.

Prices include selection and delivery.

FABRIC.—The news of labour troubles in Ireland is very grave indeed, and it would not be surprising to learn that it was a result of "Hunnish intrigue." In any case it must be settled soon, otherwise constructors will be very seriously handicapped.

The official prices continue unchanged.

Official Prices.

R.A.F.,17C Cloth, 2s. 8d. per yard, 36 in. wide.
R.A.F., 17C Cloth, 2s. 9½d. per yard, 38 in. wide.

PRAISE FROM A HANDBOOK.

In a recent practical manual on autogenous welding, the authors deal fully with the immense varieties of metal repairs that can be effected by scientific welding as practised by Barimar, Ltd., 10, Poland Street, Oxford Street, London, W. They point out that the process is not in use in some foundries which, it would appear, still cling to antiquated methods such as the "burning on" process for treating fractured castings. The authors rightly emphasise that, with a scientific weld, the part treated can be considered as good as new, since the metal added is at least as good in quality as the original article. Those foundries who from conscientious motives hesitate to employ scientific welding have only to reproach themselves because, as the authors truly remark, "even badly applied autogenous welding is a process a hundred times preferable to the obsolete methods still in use in certain foundries."

THE AEROPLANE

Acetylene Welding Plant—

Imperial Light, Ltd., 123, Victoria St., S.W. "Edibras, Phone, London." Victoria 3540.

Aeroplane Manufacturers—

Aircraft Manufacturing Co., Ltd., Hendon. "Airmanship, Hyde, London." Kingsbury 180.

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. "Armstrong Aviation, Newcastle-on-Tyne." Gosforth 500.

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds "Propellors, Leeds." Roundhay 345 (3 lines).

Boulton & Paul, Ltd., Rose Lane Works, Norwich. "Aviation, Norwich." Norwich 851.

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. "Aviation, Bristol." Bristol 3906.

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. "Caudroplan, Crickle, London." Hampstead 5551.

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145

Eastbourne Aviation Co., Ltd., Eastbourne. "Aircraft, Eastbourne." Eastbourne 1176.

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. "Volplane, Hyde, London." Kingsbury 120.

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. "Hydrophid, Crickle, London." Hampstead 7420.

Mann, Egerton & Co., Aircraft Works, Norwich. "Motors, Norwich." Norwich 482 (4 lines).

Martinsyde, Ltd., Brooklands, Byfleet. "Martinsyde, Weybridge." Woking 331; Byfleet 171.

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. "Nieuscout, Crickle, London." Willesden 2455.

Norman-Thompson Flight Co., Ltd., Bognor. "Soaring, Bognor." Bognor 48.

The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. "Carbodis, London." Putney 2240-2241.

Roe, A. V., & Co., Ltd., Manchester. "Triplane, Manchester." City 8530-8531, Manchester.

Sage, Frederick & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.

Saunders, S. E., Ltd., East Cowes, I.O.W. "Consuta, East Cowes." Cowes 193.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. "Tested, Phone, London." Regent 378.

Sopwith Aviation Co., Ltd., Kingston-on-Thames. "Sopwith, Kingston." Kingston 744.

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street W.C.2. "Gunsignrush, Estrand, London." City 89.

Vickers, Ltd., Imperial Court Basil Street, Knightsbridge, S.W.3. "Vickerfyta, Knights, London." Kensington 6810.

Waring & Gillow, Ltd., Hammersmith. "Warisen, Ox, London." Museum 5000.

Westland Aircraft Works, Yeovil. "Aircraft, Yeovil." Yeovil 129.

White, J. Samuel, & Co., Ltd., East Cowes. "White, East Cowes." Cowes 3.

Airships—

Airships, Ltd., High Street, Merton. Wimbledon 1314.

Short Bros., Rochester, Eastchurch, and Whitehall House, S.W. "Tested, 'Phone, London." Regent 378.

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1 "Krankases, Isling, London." City 7846.

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. "Lucraftia, London." Avenue 2217.

Aluminium Presswork (Stampings, Etc.)—

Willans & Robinson, Ltd., Victoria Works, Rugby. "Willans, Rugby." Rugby 112 (3 lines).

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. "Yes, Leeds." Central 3927.

Brass Sheets for Tipping Propellers—

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. "Lucraftia, London." Avenue 2217.

Pritt & Co., 46, Fenchurch Street, London, E.C.3. "Poetry, Fen, London." Avenue 995, 996, and 7006.

Buildings—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. "Aviation, Norwich." Norwich 851.

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. "Bizfibild, London." Victoria 8868.

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313

The Wilfley Co., Ltd., Salisbury House, London Wall, E.C.2. "Wrathless, Phone, London." City 2681-2

Cable Coverings and Cable Controls—

Herbert Terry & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61.

Capstan Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. "Lucraftia, London." Avenue 2217.

Castings (Aluminium, Brass, Bronze, Machined or Rough)—

Coan, R. W., 219, Goswell Road, London, E.C.1. "Krankases, Isling, London." City 3846.

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.

Willans & Robinson, Ltd., Victoria Works, Rugby. "Willans, Rugby." Rugby 112 (3 lines).

Cellon—

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. "Ajawb, London." London Wall 5359-3622.

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. "Greenberg, London." Central 1306-7.

London Label Co., Beckton Road, E.16. "Lonlabel, Canning, London." East 1300.

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's Ltd., Euston Road, N.W.1. "Dunsend, London." North 3405-6.

Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—

Accles & Pollock, Ltd., Oldbury, Birmingham. "Accles, Oldbury." Oldbury 111 (4 lines).

B. D. V. Aircraft Spares, Syon Chambers, 161, Kew Road, Richmond, Surrey. "Aeros, Richmond." Richmond 1681.

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead, 4728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. "Aercracons, Canning, London." East 1300.

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. "Cordage, Greenock." Greenock 618.

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30. Newgate Street, E.C.1. And at Glasgow. City 3115.

Dopes—

British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. "Tetrafree, Piccy, London." Gerrard, 2312.

British Cellulose Co., 8, Waterloo Place, S.W.1. "Cellutate, London." Regent 4046.

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. "Ajawb, London." London Wall 5359-3622.

Clark, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. "Pearline, Vic, London." Victoria 2923.

Elastic Cords—

Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2. "Elastics, London." City 22.

Electrical Accessories—

Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. "Installing, Euston, London." Museum 70.

Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. "Fahrenheit, Birmingham." Midland 081.

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. "Ediswan, Enfield." Enfield 520 (6 lines).

Electric Cables—

E. Kalker & Co., Coventry. "Kalker, Coventry." Coventry 24x.

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. "Pump, Bedford." Bedford No. 1.

Arrol-Johnston, Ltd., Dumfries. "Mocar, Dumfries." Dumfries 281-282.

The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000

Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. "Beardmore, London." Gerrard 238

Dudbridge Iron Works, Ltd. (Salmson), 87 Victoria Street, London S.W.1. "Aeroflight, Vic, London." Vic 7026

Gordon Watney & Co., Ltd., Weybridge "Mercedès, Weybridge." Weybridge 550 (7 lines)

Green Engine Co., Ltd., Twickenham. Richmond 1293

Gwynnes, Ltd., Hammersmith Iron Works Hammersmith, W. "Gwynne, Hammersmith." Hammersmith 191

The Selsdon Aero & Engineering Co., Ltd Imperial House, Kingsway, W.C.2. Regent 118

Sturtevant, B. F., Co., Ltd., Hyde Park, Boston U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton "Moorfield, Wolverhampton." Wolverhampton 98

The Gnôme & Le Rhône Engine Co., Ltd 47, Victoria Street, S.W. "Elevenfold London." Walthamstow 408 (2 lines

Willans & Robinson, Ltd., Victoria Work Rugby. "Willans, Rugby." Rugby 112 (3 lines

Flexible Shafts—

Herbert Terry & Sons, Ltd., Redditc "Springs, Redditch." Redditch 6

Flying Schools—

Bournemouth Aviation Co., Ltd., Talbot V lage, Bournemouth. "Etches, Winton." Bournemouth 11

Cambridge School of Flying & Aerodrome C Ltd., 30b, St. Andrews Street, Cambrid

Furniture Office)

Cookes (Finsbury), Ltd., Finsbury Pavem House, London, E.C.2. London Wall 573 and 61

Galvanising—

Boulton & Paul, Ltd., Rose Lane Wor Norwich. "Aviation, Norwich." Norwich 8

Cowper-Coles Manufacturing Co., Sunbury- Thames. Sunbury

Gears—

Moss Gear Co., Ltd., Thomas Street, Ast Birmingham. "Mosgear, Birmingham." East 4

Glue—

Improved Liquid Glues Co., Ltd., Gt. Her tage Street, E. (Croid.). "Excroid Wapp, London." Avenue 31

Mendine Co., 8, Arthur Street, E.C. Bank 5

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albem Street, Piccadilly, W.1. "Shatterlys, Pic London." Regent 1

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, L Acre, W.C. "Comyn, Ching, Westc London." Gerard 1077 (3 lin

Chas. P. Kinnell & Co., Ltd., 65 & Southwark Street, London, S.E.1. "Kinn London." Hop 372 (2 lin

Instruments—

British Wright Co., Ltd., 33, Chancery L W.C.2. Holborn 1

Instruments (Scientific, A meters, etc.)—

Short & Mason, Ltd., Macdonald R Walthamstow, E.17. "Aneroid, Ph London." Walthamstow

Machine Tools—

Brewster & Co., 11, Queen Victoria St E.C.4. "Circumfuse, Cannon, London City

Magneto Driving Pieces—

Herbert Terry & Sons, Ltd., Redd "Springs, Redditch." Redditch

Magnetos—

The M-L Magneto Syndicate, Ltd., Vic Works, Coventry. "Corlton, Coventry Coventry 1008

The British Lighting & Ignition Co., 204, Tottenham Court Road, W.1. "V mag, Phone, London." Museum

Metal Manufacturers—

Clifford, Chas., & Sons, Ltd., Birming "Clifford, Birmingham." Central 4

Metals in General—

Samuel Mercer & Co., 198, Upper Th Street, E.C.4. "Reconciled Cannon, don." City

Pritt & Co., 46, Fenchurch Street, Lo E.C.3. "Poetry, Fen, London." Avenue 995, 996, and

BUYERS' GUIDE.

etal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. "Accles, Oldbury." Oldbury 111 (3 lines).
Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. "Upcast, Holb, London." Holborn 858.
Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2297.
Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) "Bayliss, Wolverhampton." Wolverhampton 1041.
The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. "Handicraft." Central 3705.
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds "Propellors, Leeds." Roundhay 345 (3 lines).
W. H. Briscoe & Co., Ltd. 51 & 52, Park Street, Birmingham. "Brisk Bham." Central 550.
The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow, London. "Golshel, Hounslow." Hounslow 254.
Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. "Installing, Eusroad, London." Museum 70.
Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham "Fremo, Birmingham." Kings Norton 261.
Rubery, Owen, & Co., Ltd., Darlaston. "Roofs, Darlaston." Darlaston 87.
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. "Sankey, Wellington, Salop." Wellington 66.
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.
The Aircraft Construction Co., Harlev Works, Beckton Road, E.16. "Aercracons, Canning, London" East 1300.
Thompson Bros., Ltd., Bradley, Bilston. "Thompson Bros, Bilston." Bilston 10.
Wooler Engineering Co., Ltd., Old Oak Common Lane, Willesden Junction, N.W.10.

etal Shearing Tools—

Montgomery, Smith, & Co., Ltd., Tangent Works, Keynsham, near Bristol. "Ingenuity, Saltford." Keynsham 21.

etal Spinnings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.

etric Bolts—

Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

iscellaneous—

Anderson, D., & Son, Ltd. (Roofs), Belfast. "Anderson, Belfast." Belfast 4033-4034-4035.
Anti-Glare Glass Co., Ltd., 76, Turnmill Street, E.C. Central 3731.
Bowden Wire, Ltd., Willesden Junction, "Bowirelim, Harles, London." Willesden 2400 (3 lines).
Brown Bros., Ltd., Great Eastern Street, E.C.1. "Imbrowned, Bethroad, London." London Wall 6300.
Edison Swan Electric Co., Ponder's End. (Lamps.) "Ediswan, Enfield." Enfield 520 (6 lines).
Endolithic Manufacturing Co., Ltd., 61½, Fore Street, London, E.C.2.
Herbert Frood Co., Ltd., Chapel-en-le-Frith. "Frodobrake, Birmingham." Central 793.
Glasso Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.
London Label Co., Ltd., Harley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. "Lonlabel, Canning, London." East 1300.
MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

otor Cars—

Arrol Johnston, Ltd., Dumfries. "Mocar, Dumfries." Dumfries 281-282.
Mann, Egerton & Co., Ltd., 379/381, Euston Road, London, N.W.1. "Manegecar, Eusroad, London." Museum 70.
Standard Motor Car Co., Coventry. "Flywheel, Coventry." Coventry 530 (4 lines).

ameplates and Labels—

Endolithic Manufacturing Co., Ltd., 61½, Fore Street, London, E.C.2.
The Clegg Metal Engraving Co., Chatsworth Works, Worthing. "Clegg Worthing."

bservation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. "Shatterlys, Piccy, London." Regent 1340.

atent Agents—

King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.
Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.
Stanley Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

etrol Storage (Bulk)—

Bywater & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. "Bywaterist, London." Gerrard 2220.

Piston Rings—

British Chuck & Piston Ring Co., Coventry. "Rings, Coventry." Coventry 723.

Power Presses and Dies—

Bliss, E. W., & Co., 23, Pocock Street, Blackfriars Road, London, S.E.1. "Blissdon, London." Hop 4340.

Presswork—

Terry Herbert & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 3 lines).

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. "Propellors, Leeds." Roundhay 345 (3 lines).
Boulton & Paul, Ltd., Rose Lane Works, Norwich. "Aviation, Norwich." Norwich 851.
Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. "Ebora, Kingston." Kingston 672.
Integral Propeller Co., Ltd. "Aviprop, Hyde, London." Hendon 9. Kingsbury 104.
Lang Propeller, Ltd., Weybridge. "Aerosticks, Weybridge." Weybridge 520-521.
Mann, Egerton & Co., Ltd., Aircraft Works, Norwich. "Motors, Norwich" Norwich 482 (4 lines).
Oddy, W. D., & Co., Leeds. "Airscrews, Leeds." Central 291, Leeds.
Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.
Stanley Aviation Co., 67, Kingsland Road, E.2. City 8347.
Westland Aircraft Works, Yeovil. "Aircraft, Yeovil." Yeovil 129.

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. "Cradock, Wakefield." Wakefield 466.

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. "Ediswan, Enfield." Enfield 520 (6 lines).

Safety Belts—

Holmes, C. H., & Son, 38, Albert Street, Manchester. "Semloh, Manchester." City 4432.
Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. "Krankases, Isling, London." City 3846.

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. "Instrument, Leeds." Chapeltown 474.

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. "Propellors, Leeds." Roundhay, 345 (3 lines).
Mann, Egerton & Co., Ltd., Aircraft Works, Norwich. "Motors, Norwich." Norwich 482 (4 lines).
The Norman Thompson Flight Co., Ltd., Middleton, Bognor. "Soaring, Bognor." Bognor 48.
Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.
Short Bros., Rochester. "Seaplanes, Rochester." Chatham 627.
Supermarine Aviation Co., Ltd., Southampton. "Supermarine, Southampton." Southampton 1337.

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50 Park Lane, Leeds. Central 3437.

Shackles—

The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. "Golshel, Hounslow." Hounslow 254.

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. "Accles, Oldbury." Oldbury 111 (3 lines).
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. "Propellors, Leeds." Roundhay 345.
Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497 Birmingham.
Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. "Colpressed, Birmingham." Central 7188.
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Shock Absorbers (Elastic Cord)—

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.
Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.
Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. "Elastics, London." City 22.

Sheet Metal Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.

Sparking Plugs—

Forward Motor Co., Sumner Row, Birmingham. Central 6259.
Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.
Lodge Sparking Plug Co., Ltd., Rugby. "Igniter, Rugby." Rugby 235.
Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. "Ripault, Reg, London." Gerrard 7758.

Springs—

Dart Spring Co., West Bromwich. "Dart, West Bromwich." West Bromwich 322.
Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.
Terry, Herbert, & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61 (3 lines).

Steel—

Firth, Thos., & Sons, Sheffield. "Firth, Sheffield." Sheffield 3230 to 3237.
Nicklin, Bernard, & Co., Birmingham. "Bernico, Birmingham." Smithwick 224.

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield. "Cradock, Wakefield." Wakefield 466 (3 lines).

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. "Accles, Oldbury." Oldbury 111 (3 lines).

Taper Pins—

Mountford, Fredk. (Birmingham), Ltd., Fremo Works, Lifford, Birmingham. "Fremo, Birmingham." King's Norton 261-262.

Tapes and Smallwares—

MacLennan, John, & Co., 30, Newgate Street, E.C.1. And at Glasgow. City 3115.
James North Hardy & Son, Ltd., 54, Portland Street, Manchester. "Hardson, Manchester." Central 6471.

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. "Entikosil, Vic, London." Victoria 5073, 4210.
Brown, R. F., & F. W., Wollaton Saw Mills, near Nottingham. "Brown's Saw Mills, Wollaton." Nottingham 1526.

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. "Beldam Tyres, Brentford." Ealing 125-126.
The Palmer Tyre, Ltd., Shaftesbury Avenue. "Tyricord, Weskent." Gerrard 1214 (4 lines).

Varnishes—

Clark, R. Ingham, & Co., Caxton House, S.W.1. "Pearline, Vic, London." Victoria 2923.
Harland, W., & Son, Merton, London, S.W.19. "Harland, Wimbledon 45." Wimbledon 45 and 1395.
Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. "Varnish, London." East 760 (2 lines).
Naylor Bros., Ltd., Southall, Middlesex. "Naylor, Southall." Southall 30.

Washers—

Herbert Terry & Sons, Ltd. Redditch. "Springs, Redditch." Redditch 61.

Watchmakers and Jewellers (Silver Models)—

Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—

Barimar, Ltd., 10, Poland Street, W.1. "Barimar, Reg, London." Gerrard 8173.

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. "Winflector, London." Regent 5910.
London Label Co., Ltd., Hadley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. "Lonlabel, Canning, London." East 1300.
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. "Shatterlys, Piccy, London." Regent 1340.

Wires and Cables (Aeroplanes)—

Bruntons, Musselburgh, Scotland. "Wiremill, Musselburgh." Musselburgh 28.
Cradock, Geo., & Co., Ltd., Wakefield. "Cradock, Wakefield." Wakefield 466 (3 lines).

Wirework—

Herbert Terry & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61.

Woodworking Machinery—

Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. "Robinson, Rochdale." Rochdale 467.
Sagar, J., & Co., Ltd., Halifax. "Sawtooth, Halifax." Halifax 136.
Wadkin & Co., Leicester. "Woodworker, Leicester." Leicester 3614.

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Acetylene Welding Plant—

Imperial Light, Ltd., 123, Victoria St., S.W. "Edibras, Phone, London." Victoria 3540.

Aeroplane Manufacturers—

Aircraft Manufacturing Co., Ltd., Hendon. "Airmanship, Hyde, London." Kingsbury 180.

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. "Armstrong Aviation, Newcastle-on-Tyne." Gosforth 500.

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds "Propellors, Leeds." Roundhay 345 (3 lines).

Boulton & Paul, Ltd., Rose Lane Works, Norwich "Aviation, Norwich." Norwich 851.

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. "Aviation, Bristol." Bristol 3006.

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. "Caudroplan, Crickle, London." Hampstead 5551.

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145

Eastbourne Aviation Co., Ltd., Eastbourne. "Aircraft, Eastbourne." Eastbourne 1176.

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. "Volplane, Hyde, London." Kingsbury 120.

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. "Hydrophid, Crickle, London." Hampstead 7420.

Mann, Egerton & Co., Aircraft Works, Norwich. "Motors, Norwich." Norwich 482 (4 lines).

Martinsyde, Ltd., Brooklands, Byfleet. "Martinsyde, Weybridge." Woking 331; Byfleet 171.

National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. "Nieuscout, Crickle, London." Willesden 2455.

Norman-Thompson Flight Co., Ltd., Bognor. "Soaring, Bognor." Bognor 48.

The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. "Carbodis, London." Putney 2240-2241.

Roe, A. V., & Co., Ltd., Manchester. "Triplane, Manchester." City 8530-8531, Manchester

Sage, Frederick & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.

Saunders, S. E., Ltd., East Cowes, I.O.W. "Consuta, East Cowes." Cowes 163.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. "Tested, Phone, London." Regent 378.

Sopwith Aviation Co., Ltd., Kingston-on-Thames. "Sopwith, Kingston." Kingston 744.

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. "Gunsingrush, Estrand, London." City 80.

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. "Vickerlvta, Knights, London." Kensington 6810.

Waring & Gillow, Ltd., Hammersmith. "Warisen, Ox, London." Museum 5000.

Westland Aircraft Works, Yeovil. "Aircraft, Yeovil" Yeovil 129.

White, J. Samuel, & Co., Ltd., East Cowes. "White, East Cowes." Cowes 3.

Airships—

Airships, Ltd., High Street, Merton

Short Bros., Rochester, Eastchurch, and Whitehall House, S.W. "Tested, 'Phone, London." Regent 378.

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1 "Krankases, Isling, London." City 3846.

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. "Lucraftia, London." Avenue 2217.

Aluminium Presswork (Stampings, Etc.)—

Willans & Robinson, Ltd., Victoria Works, Rugby. "Willuns, Rugby." Rugby 112 (3 lines).

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. "Yes, Leeds." Central 3927.

Brass Sheets for Tipping Propellers—

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. "Lucraftia, London." Avenue 2217.

Pritt & Co., 46, Fenchurch Street, London, E.C.3. "Poetry, Fen, London." Avenue 995, 996, and 7016.

Buildings—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. "Aviation, Norwich." Norwich 851.

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. "Bizfibld, London." Victoria 8868.

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313

The Wilfley Co., Ltd., Salisbury House, London Wall, E.C.2. "Wrathless, Phone, London." City 2681-2

Cable Coverings and Cable Controls—

Herbert Terry & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61.

Capstan Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Castings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. "Lucraftia, London." Avenue 2217.

Castings (Aluminium, Brass, Bronze, Machined or Rough)—

Coan, R. W., 219, Goswell Road, London, E.C.1. "Krankases, Isling, London." City 3846.

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.

Willans & Robinson, Ltd., Victoria Works, Rugby. "Willans, Rugby." Rugby 112 (3 lines).

Cellon—

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. "Ajawb, London." London Wall 5359-3622.

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. "Greenberg, London." Central 1306-7.

London Label Co., Beckton Road, E.16. "Lonlabel, Canning, London." East 1300.

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's Ltd., Euston Road, N.W.1. "Dunsend, London." North 3405-6.

Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—

Accles & Pollock, Ltd., Oldbury, Birmingham. "Accles, Oldbury." Oldbury 111 (4 lines).

B. D. V. Aircraft Spares, Syon Chambers, 160, Kew Road, Richmond, Surrey. "Aeros, Richmond." Richmond 1681.

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead, 4728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. "Aerocracos, Canning, London." East 1300.

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. "Cordage, Greenock." Greenock 618.

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30, Newgate Street, E.C.1. And at Glasgow. City 3115.

Dopes—

British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. "Tetrafrec, Piccy, London." Gerrard, 2312.

British Cellulose Co., 8, Waterloo Place, S.W.1. "Cellulate, London." Regent 4046.

Celion, Ltd., Broad Street House, New Broad Street, E.C.2. "Ajawb, London." London Wall 5359-3622.

Clark, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. "Pearline, Vic, London." Victoria 2923.

Elastic Cords—

Tubbs, Lewis, & Co., 29 & 30, Noble Street, E.C.2 "Elastics, London" City 22.

Electrical Accessories—

Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. "Installing, Euston road, London." Museum 70.

Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. "Fahrenheit, Birmingham." Midland 681.

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. "Ediswan, Enfield." Enfield 520 (6 lines).

Electric Cables—

E. Kalker & Co., Coventry. "Kalker, Coventry." Coventry 248.

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. "Pump, Bedford." Bedford No. 1.

Arrol-Johnston, Ltd., Dumfries. "Mocar, Dumfries." Dumfries 281-282.

The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 1000.

Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. "Beardmore, London." Gerrard 238.

Dudbridge Iron Works, Ltd. (Salmson), 87, Victoria Street, London S.W.1. "Aeroflight, Vic, London." Vic 7006.

Gordon Watney & Co., Ltd., Weybridge. "Mercedès, Weybridge." Weybridge 550 (7 lines).

Green Engine Co., Ltd., Twickenham. Richmond 1203.

Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. "Gwynne, Hammersmith." Hammersmith 1910

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sturtevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton. "Moorfield, Wolverhampton." Wolverhampton 685.

The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W. "Elevenlec, London." Walthamstow 408 (2 lines).

Willans & Robinson, Ltd., Victoria Works, Rugby. "Willans, Rugby." Rugby 112 (3 lines).

Flexible Shafts—

Herbert Terry & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61.

Flying Schools—

Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. "Eiches, Winton." Bournemouth 1180.

Cambridge School of Flying & Aerodrome Co., Ltd., 30b, St. Andrews Street, Cambridge

Furniture (Office)

Cookes (Finsbury), Ltd., Finsbury Pavement House, London, E.C.2. London Wall 573 and 6179.

Galvanising—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. "Aviation, Norwich." Norwich 851.

Cowper-Coles Manufacturing Co., Sunbury-on-Thames. Sunbury 37.

Gears—

Moss Gear Co., Ltd., Thomas Street, Aston, Birmingham. "Mosgear, Birmingham." East 407.

Glue—

Improved Liquid Glues Co., Ltd., 61, Herrietage Street, E. (Croid.). "Excrescih, Wapp, London." Avenue 3178.

Mendine Co., 8, Arthur Street, E.C. Bank 5073.

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. "Shatterlys, Piccy, London." Regent 1340.

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. "Comyn, Ching, Westrand, London." Gerrard 1077 (3 lines).

Chas. P. Kinnell & Co., Ltd., 65 & 68, Southwark Street, London, S.E. "Kinnell, Southwark, London." Hop 372 (2 lines).

Instruments—

British Wright Co., Ltd., 33, Chancery Lane, W.C.2. Holborn 6[illegible].

Instruments (Scientific, Altimeters, etc.)—

Short & Mason, Ltd., Macdonald Road, Walthamstow, E.17. "Aneroid, Phone, Walthamstow, London."

Machine Tools—

Brewster & Co., 11, Queen Victoria Street, E.C.4. "Circumfuse, Cannon, London." City [illegible].

Magneto Driving Pieces—

Herbert Terry & Sons, Ltd., Redditch. "Springs, Redditch."

Magnetos—

The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. "Coelton, Coventry." Coventry [illegible].

The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. "Lucigen, Phone, London." Museum 4[illegible].

Metal Manufacturers—

Clifford, Chase, & Sons, Ltd., Birmingham. "Clifford, Birmingham." Central 2[illegible].

Metals in General—

Samuel Mercer & Co., 393, Upper Thames Street, E.C.4. "Reconcilted, London." City [illegible].

Pritt & Co., 46, Fenchurch Street, London, E.C.3 "Poetry, Fen, London." Avenue 995, 996, 2[illegible].

Metal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. "Accles, Oldbury." Oldbury 111 (3 lines).

Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. "Upcast, Hulb, London." Holborn 858.

Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2267.

Baillie, Jones & Bayliss, Ltd., Wolverhampton. "Bells and Nuts." "Baylies, Wolverhampton." Wolverhampton 1041.

The Birmingham Guild, Ltd., 45, 61, Charles Street, Birmingham. "Handicraft." Central 3705.

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds "Propellors, Leeds." Roundhay 345 (3 lines).

W. H. Briscoe & Co., Ltd., 51 & 52, Park Street, Birmingham. "Brisk Bham." Central 550.

The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow, London. "Golshel, Hounslow." Hounslow 254.

Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. "Tastalling, Euston road, London." Museum 70.

Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham "Fremo, Birmingham." Kings Norton 261.

Robery, Owen, & Co., Ltd., Darlaston. "Roofs, Darlaston." Darlaston 87.

Salter, Joseph, & Sons, Ltd., Wellington, Shropshire. "Sankey, Wellington, Salop." Wellington 16.

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. "Aerocracos, Canning, London" East 1300.

Thompson Bros., Ltd., Bradley, Bilston. "Thompson Bros., Bilston." Bilston 10.

Vickers Engineering Co., Ltd., Old Oak Common Lane, Willesden Junction, N.W.10.

Metal Shearing Tools—

Engineers, Smith, & Co., Ltd., Tangent Works, Keynsham, near Bristol. "Ingenuity, Saltford." Keynsham 21.

Metal Spinnings—

Gabriel & Co., 4 and 5, A B Row, Birmingham "Gabriel, Birmingham." Central 1223.

Metric Bolts—

Simmer Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.

Miscellaneous—

Anderson, D., & Son, Ltd. (Roofs), Belfast. "Anderson, Belfast." Belfast 40334034-40335.

Anti-Glare Glass Co., Ltd., 76, Turnmill Street, E.C. Central 3731.

Bowden Wire, Ltd., Willesden Junction, "Bowirelim, Harles, London." Willesden 2400 (3 lines).

Brown Bros., Ltd., Great Eastern Street, E.C.1. "Imbrowned, Bethroad, London." London Wall 6700.

Edison Swan Electric Co., Ponder's End, Middx.) "Ediswan, Enfield." Enfield 520 (6 lines).

Embolithic Manufacturing Co., Ltd., 61½, Fore Street, London, E.C.2.

Hobart Wood Co., Ltd., Chapel-en-le-Frith. "Frodobrake, Birmingham." Central 793.

Nelson Manufacturing Co., Ltd., 211, City Road, E.C. City 6558.

London Label Co., Ltd., Harley Works, Beckton Road E.16. "Nonflamoid" Noninflammable Celluloid. "Lonlabel, Canning, London." East 1300.

Mackennan, J., & Co., 30, Newgate Street, E.C.1, and at Glasgow. Tapes, Cords and Thread. City 3115.

Motor Cars—

Arrol Johnston, Ltd., Dumfries. "Mocar, Dumfries" Dumfries 281-282.

Mann, Egerton & Co., Ltd., 379/381, Euston Road, London, N.W.1. "Manegecar, Euston road, London." Museum 70.

Standard Motor Car Co., Coventry. "Flywheel, Coventry." Coventry 530 (4 lines).

Nameplates and Labels—

Embolithic Manufacturing Co., Ltd., 61½, Fore Street, London, E.C.2.

Clegg Metal Engraving Co., Chatsworth Works, Worthing. "Clegg Worthing."

Observation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. "Shatterlys, Piccy, London." Regent 1340.

Patent Agents—

Edwards' Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.

Marks & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.

Reddie & Grose, 16, Bedford Row, W.C. Central 1763.

Rippolewell & Co., 38, Chancery Lane, W.C. Central 1763.

Petrol Storage (Bulk)—

Foster & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. "Hydrostist, London." Gerrard 2220.

Piston Rings—

British Chuck & Piston Ring Co., Coventry. "Rings, Coventry." Coventry 723.

Power Presses and Dies—

Bliss, E. W., & Co., 20, Pocock Street, Blackfriars Road, London, S.E.1. "Blissdon, London." Hop 4340.

Presswork—

Terry, Herbert & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 3 lines).

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia Leeds. "Propellors, Leeds." Roundhay 345 (3 lines).

Boulton & Paul, Ltd., Rose Lane Works, Norwich. "Aviation, Norwich." Norwich 851.

Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. "Ebora, Kingston." Kingston 972.

Integral Propeller Co., Ltd. "Axiprop, Hyde, London." Hendon 9, Kingsbury 104.

Lang Propeller, Ltd., Weybridge. "Aerosticks, Weybridge." Weybridge 520-521

Mann, Egerton & Co., Ltd., Aircraft Works, Norwich "Motors, Norwich." Norwich 482 (4 lines).

Oddy, W. D., & Co., Leeds. "Airscrews, Leeds." Central 291, Leeds.

Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.

Stanley Aviation Co., 67, Kingsland Road, E.2. City 8347.

Westland Aircraft Works, Yeovil. "Aircraft, Yeovil." Yeovil 129.

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. "Cradock Wakefield." Wakefield 466.

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex "Ediswan, Enfield." Enfield 520 (6 lines).

Safety Belts—

Holmes, C. H., & Son, 38, Albert Street, Manchester. "Semloh, Manchester." City 4432.

Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. "Krankases, Isling, London." City 3846.

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. "Instrument, Leeds." Chapeltown 474.

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. "Propellors, Leeds." Roundhay, 345 (3 lines).

Mann, Egerton & Co., Ltd., Aircraft Works, Norwich. "Motors, Norwich." Norwich 482 (4 lines).

The Norman Thompson Flight Co., Ltd., Middleton, Bognor. "Soaring, Bognor." Bognor 48.

Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.

Short Bros., Rochester. "Seaplanes, Rochester." Chatham 627.

Supermarine Aviation Co., Ltd., Southampton. "Supermarine, Southampton." Southampton 1337.

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50 Park Lane, Leeds. Central 3437.

Shackles—

The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. "Golshel, Hounslow." Hounslow 254.

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. "Accles, Oldbury." Oldbury 111 (3 lines).

Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. "Propellors, Leeds." Roundhay 345.

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.

London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 407 Birmingham.

Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. "Colpressed, Birmingham." Central 7168.

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Shock Absorbers (Elastic Cord)—

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.

Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.

Tubbs, Lewis & Co., 29 & 30, Noble Street, E.C.2. "Elastics, London." City 22.

Sheet Metal Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.

Sparking Plugs—

Forward Motor Co., Summer Row, Birmingham Central 1050.

Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.

Lodge Sparking Plug Co., Ltd., Rugby. "Igniter, Rugby." Rugby 235.

Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. "Ripault, Reg, London." Gerrard 7758.

Springs—

Dart Spring Co., West Bromwich. "Dart, West Bromwich." West Bromwich 322.

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.

Terry, Herbert, & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61 (3 lines).

Steel—

Firth, Thos., & Sons, Sheffield. "Firth, Sheffield." Sheffield 3230 to 3237.

Nicklin, Bernard, & Co., Birmingham. "Bernico, Birmingham." Smithwick 224.

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield. "Cradock, Wakefield." Wakefield 466 (3 lines).

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. "Accles, Oldbury" Oldbury 111 (3 lines).

Taper Pins—

Mountford, Fredk. (Birmingham), Ltd., Fremo Works, Lifford, Birmingham. "Fremo, Birmingham." King's Norton 261-262.

Tapes and Smallwares—

MacLennan, John, & Co., 30, Newgate Street, E.C.1. And at Glasgow City 3115.

James North Hardy & Son, Ltd., 54, Portland Street, Manchester. "Hardson, Manchester." Central 6471.

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. "Entikosil, Vic, London." Victoria 3073, 4210.

Brown, R. F., & F. W., Wellston Saw Mills, near Nottingham. "Brown's Saw Mills, Wollaton." Nottingham 3526.

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. "Beldam Tyres, Brentford." Ealing 125-126.

The Palmer Tyre, Ltd., Shaftesbury Avenue. "Tyricord, Weskent." Gerrard 1214 (4 lines).

Varnishes—

Clark, R. Ingham, & Co., Caxton House, S.W.1. "Pearline, Vic, London." Victoria 2923.

Harland, W., & Son, Merton, London, S.W.19. "Harland, Wimbledon 45." Wimbledon 45 and 1356.

Jenson & Nicholson, Ltd., Goswell Works, Stratford, E.15. "Varnish, London." East 760 (2 lines).

Naylor Bros., Ltd., Southall, Middlesex. "Naylor, Southall." Southall 30.

Washers—

Herbert Terry & Sons, Ltd. Redditch. "Springs, Redditch." Redditch 61.

Watchmakers and Jewellers (Silver Models)—

Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—

Barimar, Ltd., 10, Poland Street, W.1. "Barimar, Reg, London." Gerrard 8173.

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. "Windfector, London." Regent 5910.

London Label Co., Ltd., Hadley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. "Lonlabel, Canning, London." East 1300.

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. "Shatterlys, Piccy, London." Regent 1340.

Wires and Cables (Aeroplanes)—

Bruntons, Musselburgh, Scotland. "Wiremill, Musselburgh." Musselburgh 28.

Cradock, Geo., & Co., Ltd., Wakefield. "Cradock, Wakefield." Wakefield 466 (3 lines).

Wirework—

Herbert Terry & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61.

Woodworking Machinery—

Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. "Robinson, Rochdale." Rochdale 467.

Sagar, J., & Co., Ltd., Halifax. "Sawtooth, Halifax." Halifax 136.

Wadkin & Co., Leicester. "Woodworker, Leicester." Leicester 3614.

ON THE VALUE AND USE OF THE LARGE AEROPLANE.

[The following article, reprinted from "Aviation," New York, August 15th, is ascribed by that paper to Mr. F. Handley Page. Mr. Page, it seems, did not write the article himself, but it probably includes his views, translated by one or other of his many friends in America. In any case, the article is worth publishing on its merits. Apart from that, it seems unlikely that the figures published are accurate, for even an American journalist, knowing that his paper would ultimately reach Germany, via Holland or Scandinavia, would scarcely publish correct and modern figures for machines of real value.—Ed.]

The endeavour of the present article is to show how by the use of large aeroplanes Amercia can make her weight felt in this war to a much greater extent than by equipment of any other sort.

It is a well-known fact that the large aeroplane is an absolute necessity whenever great distances have to be travelled or large weights be carried. The high speed type of machine, with its very small margin of weight available for carrying useful loads, is of little value except for short distance fighting and high speed performance.

When great loads are to be carried or long distances be flown, one must resort to a somewhat slower machine, flying at about 100 miles per hour (instead of the 130 and more miles per hour which the speed scouts attain) and capable of carrying 20 lb. per horse-power, compared with the 7 or 8 lb. of the high speed machine.

To fully understand the diverse problems which confront the employment of the military aeroplane it is necessary to examine the conditions prevailing at present on the Western Front. There great armies, immobilised by trench warfare, are separated from one another by very short distances, so than an hour or two's flight at the outside will display to the opposing side the whole of the enemy's defence works, depots, communication lines, and so forth. The carrying out of this reconnaissance work obviously entails considerable risk to the reconnoitring machine, and for the purpose of its protection it is essential that fighters of one type or another should accompany it. In addition to this, the fighters go into action to keep away from the friendly lines enemy fighting and reconnaissance machines.

It is particularly worth attention that all these machines operate over relatively short distances only. The fighters, in particular, carry only light loads, so that their requirements are easily and amply met by the employment of small high speed scouts, which, owing to their great manœuvring ability, are able to fight at close quarters, and thus overcome the handicap of accurate gun fire, which is a conspicuous feature of present-day aerial gunnery.

Such are then the requirements that must be met by an aerial force working in conjunction with an army engaged in trench warfare. In view of the very rapid development of the aeroplane, it is, however, quite possible that the whole present system of warfare may undergo, in the near future, extensive alterations. The advent of the large, multi-engined aeroplane appears in particular to forecast such a change; it seems, therefore, worth our while to examine in what way and to what extent the large aeroplane differs from the older small type of single-engined machine.

The first quality we notice is its ability to fly considerable distances with heavy loads, and whereas its large size affords more comfort to the crew, long distances may be covered without great strain upon the occupants.

There is, however, a further quality which any multi-engine machine possesses, namely, that of alighting when and where it chooses, thus minimising the risk of a forced landing due to engine failure. If we could at the present time remove from the aeroplane's characteristics the feeling of uncertainty, we should at once advance its utility to a great extent. The multi-engine machine appears to well fulfil this requirement, for it is the engine that provides, more than anything else, at the present time, that element of uncertainty which makes a more extended use of the aeroplane problematical.

Since we are unable to build our engines very heavy, as in the case of locomotives and steamships, and so increase their reliability, we can but resort to a system of multi-engines to provide against breakdowns and so prevent the machine from landing on unsuitable ground.

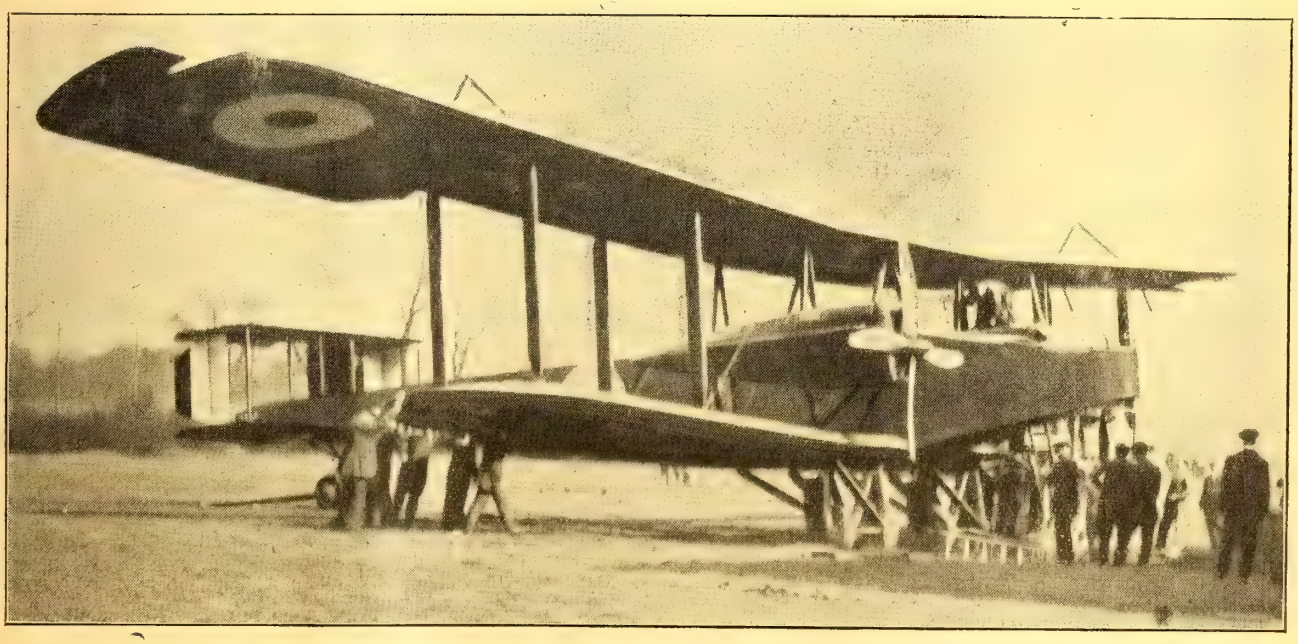
The failure of one engine should not prevent the machine from flying home with the remainder of the power plant; to be sure, the speed would be reduced, but, on the other hand, with one engine cut out, more gasoline would become available, so that a correspondingly greater distance could be covered at reduced speed.

A further advantage may be found in the relative simplification of the landing chassis, whose present elaborate design is mainly made necessary by the eventuality of landing on unsuitable ground. A multi-engine machine being able to choose its landing ground, the cost of housing would also be greatly reduced, because, instead of providing for a great number of landing places situated at short distances from one another, as has recently been suggested for commercial aviation, it would be quite sufficient to establish aerodromes only at such points where reasons of expediency required.

These considerations are also likely to alter current ideas in regard to the use of the seaplane. Seaplanes, whether of the boat or float type, have performances inferior to aeroplanes of the same size and power chiefly owing to the much greater weight and resistance of the boat or float as compared with the chassis of the aeroplane. If, however, we can discount the eventuality of a forced landing, we can just as well do away with the boat and float and employ ordinary aeroplanes for naval service, since the system of multi-engines insures the machine against being forced to alight on the sea.

A discussion of the large aeroplane naturally leads one to consider how this type of machine could be made particularly suitable to the needs of the United States in the present war. This problem may be dealt with under two headings:

1. Co-operation with the Allies on the Western Front.
2. Submarine patrol work.



THE HANDLEY PAGE BIPLANE, as illustrated in "Aviation," New York.

The present requirements of the Western Front, as far as the co-operation of the aviation service with an entrenched army is concerned, have briefly been touched upon above. There opens, however, a far greater and wider sphere for the aeroplane if one proceeds to consider a real aerial offensive. While it is true that a number of bombing raids have been conducted in the past, these expeditions never extended over great distances, and the load of bombs that has been dropped on the enemy's interior lines has, relatively speaking, been a limited one.

With the use of large squadrons of multi-engine aeroplanes this situation would be materially altered. If one imagines a fleet of several hundred of such machines, each carrying one, two, or even three tons of bombs, penetrating after a flight of many hundred miles into the very heart of the enemy country and destroying with high explosives the manufactories which are essential to the provisioning of the people and the munitioning of the armies, it will be evident that we should be able to strike a blow at the very backbone of the enemy's armies.

No gun can, at the present time, fire the distance, or deliver so much explosive at a given spot as the aeroplane, and but few guns are able to produce the same effect over much shorter distances.

Such an offensive, which appears quite feasible in view of the present development of the aeroplane, could not hitherto be developed on the Western Front partly for the lack of adequate machines and partly for the pressing need of the armies for reconnaissance and fighting aeroplanes. It is obvious that until a sufficient number of such machines be made available it is useless to think of providing or attempting to provide aeroplanes for a great aerial offensive.

This is then a question that turns upon the productive capacity of the aircraft factories. Supposing the Allied output of aeroplanes could be enormously increased in the near future, then the immediate needs of the armies in the field could be more than met and the surplus of production be turned into supplying machines for an independent aerial offensive.

Such an eventuality may readily become an accomplished fact since America's entry in the war, for this country possesses all the requirements needed for the materialisation of such an offensive. The well-known American ability for quantity production, as well as the large number of enthusiastic sportsmen that is to be found in the United States, would undoubtedly make an ideal combination for realising a great bombing campaign against Germany. Such an offensive could be carried out by a large fleet of American aeroplanes operating as a separate unit, since its work would be separate, too, from the immediate needs of the armies in the field.

I shall endeavour to describe how such an aeroplane offensive could be carried out and what actions there may take place. To begin with, it is essential that it be carried out by night, for, given adequate instruments, a place can be reached by night just as surely as in daytime, while on the other hand there is less likelihood of losing machines by anti-aircraft fire or hostile aeroplanes.

At the base a hundred of these large machines are wheeled out in the darkness of the sheds; the engines are started up and the crews go on board. The latter are small in numbers compared to those required for handling a Zeppelin airship carrying an equal load of bombs, and small is the number of assistants required to launch the machines.

The wing tips and the tail of each aeroplane are illuminated with small lights, so that each pilot can see the other's machine and avoid collision. The navigating instruments are also lighted electrically, and by the aid of these the pilot is able to steer the aeroplane to its destination.

Fully equipped with their quota of bombs, they fly on their course to their destination until the leader in charge of the squadron gives the signal that the goal is reached; each machine then aims on the target that has been set for it and releases its bombs. Immediately with the dropping of the bombs, or perhaps before, owing to the noise of the engines, the attackers are met by a defence squadron of aeroplanes and also by anti-aircraft fire from the ground directed by searchlights.

Several of the big machines carry heavy guns, and these immediately go into action on the searchlight controlled batteries. With well-aimed fire, these searchlights are put out of action and darkness reigns once more. The flares which have been dropped in order to illuminate the ground and enable the target to be seen when dropping the bombs have gone out.

In the prevailing darkness it is almost impossible for the defender squadron to find the attacking force, which is now making for home. Lightened of their load of bombs, they are able to outfly the defenders, and their ability to climb more than outweighs the pursuit machines' extra speed and endows them with sufficient manœuvring ability to beat off hostile attacks.

The day is dawning when the bombing squadrons return to their sheds, with the report that some munition factory, steel works, or power station, has been completely wiped out, and that, for some time at least, that centre of hostile industry has been demobilised, and so much less will be available for the hostile armies.

Incidentally one might remark that it is easier to land a large aeroplane in the dark than a small one, for large machines pull up quicker on the ground, and, owing to the cushioning effect of the big planes on the air between them and the ground, the alighting speed is smaller than in the case of the small aeroplanes.

For bombing work, the large aeroplane is the ideal machine. It is essential, when bombing, that the platform should be steady, and that the man in charge of the bomb dropping should have plenty of comfort, so that he may drop his bombs with some accuracy. A large machine affords a splendid platform on which to lie, excellent sighting opportunities, and great all-round steadiness. It follows, therefore, that bombing can be conducted from a large aeroplane with far greater accuracy than from a small machine where the pilot or passengers have to contend with lack of space and an unsteady platform.

Let us now turn to the question of effective fighting of submarines. The great point in favour of an airship for naval patrol is that it is able to remain floating in the air with the power shut off, the men in the car are comparatively comfortable, and thus an excellent observation station is obtained for observing any hostile ships and sending back a wireless message to the base.

Exactly the same advantages, except in point of hovering, are obtained with the large aeroplane. Owing to the excellent possibilities of observation, a much closer watch can be kept over an exceedingly large area, and much better observation can be obtained than with the ordinary small seaplane engaged in the same work.

Owing to the large size of the aeroplane, a one, two, or even three-pounder gun as well as many bombs can be carried, and if it is not possible to reach the hostile ship or submarine before it submerges, the gun can be used with effect where the bomb could not be dropped, owing to the distance of the target. Better bomb-sighting and more effective gun-fire may thus be obtained than in the case of the small aeroplane, where only machine-guns, firing rifle ammunition, can be mounted and the load of bombs is necessarily limited.

A fleet of such multi-engine aeroplanes could continuously patrol 300 to 400 miles out to sea and effectively protect in daytime the shipping lanes by escorting incoming and outgoing vessels, and thus reduce to a large extent the submarine's ability to destroy commerce.

Another interesting feature of large aeroplanes is their greater economy from the point of view of production and operation in proportion to a number of small machines possessing equal carrying capacity and speed.

A large aeroplane of, say, 600 h.p. can carry a weight of 20 lb. per horse-power, or 12,000 lb. of total weight, half of which is effective load, so that we get a useful load of 10 lb. per horse-power, or 6,000 lb. total.

Supposing, now, we had these loads separately carried by a number of small machines of, say, 200 h.p., flying at a speed of 130 m.p.h. Such machines would be able to carry about 8 to 9 lb. per horse-power, of which only 1½ lb. per horse-power could be reckoned as useful load. For every one of these machines, therefore, we should have 1½ times 200 of 300 lb. of useful load.

For a total weight of 6,000 lb. to be carried, this would require no less than twenty machines. But as the total horse-power of these twenty machines would be twenty times 200, or 4,000, against 600 h.p. required for the large aeroplane, it follows that the operation of the latter will be about six times more economical than a corresponding number of small machines. A small number of large machines, therefore, make a much smaller demand on the resources of a country than a large number of small machines, for it reduces the engine power, fuel supply and number of crews required, and, consequently, the cost of operation.

It remains now to speculate as to the aspect of warfare in the distant future when the extended use of large aeroplanes, combined with new methods of land attack, will have revolutionised the art of war.

For obtaining accurate gunfire, the gun must be mounted on a specially-made emplacement and have attached to it a suitable aeroplane for spotting at long distance the effect of its shells. This aeroplane must be equipped with radio for reporting the effect of the shells and be protected by fighting machines to beat off any enemy aeroplanes.

One can imagine all this system changing in the wars of the future. Instead of an artillery bombardment preceding the attack of the infantry from the trenches, and covering the infantry as they advance with a curtain of fire, the "preparatory fire" will be effected by aeroplanes carrying large numbers of heavy shells.

One imagines the attacking army equipped with large numbers of bombing aeroplanes which, rising up into the sky and remaining there at a height of 15,000 or 20,000 ft., will rain down on the defending army a hail of shells, sweeping away the barbed wire and entrenchments just as the ordinary artillery bombardment now does.

A continuous stream of large aeroplanes will be flying back and forth to fetch new loads of bombs to be dropped on the enemy. In front of them will sweep a cloud of small fighting aeroplanes

that will drive off the attackers which may endeavour to get at the bombing aeroplanes.

Below, instead of infantry charging the lines, masses of land battleships carrying infantry within their armoured walls will move forward as the way is cleared by the aerial bombradment.

At once we have a change from the present stagnant form of warfare: the trench is done away with, and the infantry, while maintaining its effective covering, has regained its mobility.

Play is thus again possible for the strategic and tactical abilities of the opposing generals, and warfare will, once more, become one of mobile operations, thus making possible prompt decisions.

THE HANDLEY PAGE BATTLE AEROPLANE.

A machine of the type herewith described, having accidentally landed within German lines, the following dimensional and performance data obtained during trials carried out by an Admiralty staff under Comdr. Seddon, R.N., may now be published:

Characteristics and Trial Performances.

Span, 100 ft.
Area, 1,700 sq. ft.
Gross weight, fully loaded, 11,500 lb.
Gross weight, normally loaded, 10,500 lb.
Weight, machine bare (including armour), 6,500 lb.
Horse-power, 540 (two 270 h.p. Rolls-Royce engines).
Area loading, normal, 3¾ lb. per sq. ft.; maximum, 6¾ lb.
Speed, loaded, normally, 90 m.p.h. Approximately, 40 m.p.h. low.
Climb, 10,000 ft. in 30 min. approximately.
Fuel capacity, gasoline, 400 B.I. gal. (equals 2,900 lb.).
Engine consumption, full power, 325 lb. per hr.
Endurance at full power, 9 hrs.
Endurance slightly throttled, 11 hrs.

Particulars of Load.

Gasoline	2,900 lb.
Oil	250 lb.
Crew, 3 men	540 lb.
Gun mountings and bomb gear	310 lb.
Total	4,000 lb.

To carry bombs, either fuel could be reduced or the load could be increased by 1,000 lb., as done in trials, or both The designed bomb capacity is sixteen 65 lb., or 100 lb., or 112 lb. high explosive bombs (all of which fit the same gear). On a later design provision is made for carrying eight 250 lb. bombs. The maximum load of bombs which could be carried is, therefore, 2,000 lb.; with three machine-guns and ammunition the maximum armament load is, therefore, about 2,180 lb., which correspond to 5½ hours' full power fuel with the machine loaded to maximum.

If the armour is done away with entirely, the weight light is reduced to 6,000 lb. approximately, allowing either for engines of greater power or for an additional 500 lb. of useful load.

Later Improvements.

After the Admiralty trials, various improvements were made on the machine. These consisted of the following:

1. Suppression of armour as indicated above.

2. Reduction of head resistance of engine nacelles and radiators, as a result of which a speed of 95 m.p.h. was attained with the Rolls-Royce engines.

3. Increase of horse-power by the installation of two 350 h.p. Sunbeam engines. This power plant has a lower fuel consumption than the one first installed, for it only burns 335 lb. of gasoline per hour at 680 h.p. gross. Consequently the endurance remains practically unaltered, while the speed at altitude as well as the climb is greatly increased. With the Sunbeam installation, the maximum speed at 10,000 ft. altitude is about 94 m.p.h.

A noteworthy feature of the machine is that it has never been fitted with any servo-motor control gear; this has been found quite unnecessary, chiefly owing to the large amount of inherent stability embodied in the design.

War Uses.

Actual warfare experience has proved that where military objectives are well protected by anti-aircraft guns, attacks by aircraft should be made at night. Owing to chances of collision it is, therefore, axiomatic that machines for night bombing must be as large as possible so as to reduce numbers. "Pusher view," that is, a wide arc of vision, is also essential for accurate bombing, especially by night. The Handley Page seems, therefore, *par excellence* the type for strongly defended objectives. The use of large aeroplanes by day would scarcely be permissible over areas strongly defended with anti-aircraft guns, as good results are obtained with guns up to 14,000 ft. It is, however, quite legitimate to utilise this type for day bombing of objectives not strongly defended (or well practiced) that is, Essen and all towns in Germany behind the Rhine, provided these machines are exceptionally heavily armed against aircraft attack.

To be properly armed in this sense, at least three twin machine-guns would have to be carried and probably four twin machine-guns, which would require a total crew of six men. Examination of weights and loads indicated will show that no difficulty would be experienced in carrying such armament into effect. It should be noted also that the general policy is to accompany bombing machines with gun machines if possible, making the latter of same type as the former.

Notable Performances.

Among the most notable performances of the Handley Page twin-tractor biplane may be mentioned (1) an altitude flight of 7,180 ft. with twenty-two men aboard; (2) an altitude flight of 13,000 ft. with full load, 10,000 ft. being reached in 25 minutes (this flight was made with a Sunbeam-engined model); (3) a flight from London to Paris in 2 hours 10 minutes (train and boat time, in peace, 7 hours 35 minutes); (4) a flight from London to Rome with a crew of five in 7 hours' total flying time.

THE ARROL-JOHNSON CADET CORPS.

The company of cadets, raised by the Arrol-Johnson Co., Ltd., to the number of 150, held their annual camp during the week-end of September-8th-10th, at Lochmaben. On the Saturday evening a smoking concert was held, the labours of tent-pitching, etc., making any other form of activity impracticable.

A Church Parade was held on Sunday morning, followed by an inspection in the afternoon, when Mr. T. C. Pullinger, managing director of Arrol-Johnson, Ltd., addressed the boys. The return march to Dumfries took place on the Monday morning, everyone being very pleased with the success of the affair.

U.S.A. PRODUCTION.

According to a report in "Aerial Age" of August 20th, emanating from Washington, the United States, in close co-operation with the British, French and Italian Governments, will co-ordinate all industries entering into the great aviation programme upon which the nation embarked with the granting by Congress of a 640,000,000 dol. appropriation.

The Aircraft Production Board, acting for the Government, will arrange for the purchase of all aeroplane spruce and other wood entering into construction and distribute it to Great Britain, France, Italy and the United States in proportion to the needs of each country.

Ultimately all steel will be manufactured in this country, and distributed in the same way, releasing British, French and Italian steel for other war purposes.

SCIENTIFIC ADVERTISING.

Attention is drawn to the work of Mr. George Webster, of 55, Norton Street, Old Chapel, Manchester, who makes a speciality of aviation, motoring and engineering advertising. Mr. Webster has had practical experience in well-known aircraft concerns and he is, therefore, able to evolve designs which are not merely artistic, but technically accurate, and he has a number of clients among the advertisers in The Aeroplane. Mr. Webster is at present engaged with the Avro Company, where he is in charge of the Publicity Department. He is also the Editor of the "Joy-stick," the very readable house magazine of this pioneer firm.

Notwithstanding this work, Mr. Webster is free to undertake advertising business for any other firm, and, as announced on his note heading, he has branches at Liverpool, Stockport, and Bristol, which indicates a widely separated clientèle.

There is no doubt that effective designs are an important feature in successful advertising, and advertisers may find themselves relieved of much trouble and a good deal of anxiety by placing their work in the hands of an advertising agent who thoroughly understands the special requirements of aviation.

THE WADKIN PATENT AUTOMATIC PROPELLER SHAPING MACHINE.

At this critical period of the war, when the energies and time of most of the readers of The Aeroplane are taxed to their utmost in the production of aeroplanes, a photograph and description of the latest model of the automatic propeller shaping machine, manufactured by Messrs. Wadkin and Co., of Leicester, will be interesting.

The machine has now been on the market nearly three years. During this period it has been constantly developed and improved by incorporating in its design the practical suggestions of many of the propeller manufacturers

It is now firmly established as one of the most important and essential labour-saving machines in the propeller shop, and has already been installed by all the leading propeller makers, many of whom have a number of these machines working night and day.

In order to give some idea of the amount of hand labour saved by the introduction of this machine, the makers state that a 10-ft. two-bladed propeller may be cut in 1¾ hours by their standard rate of feed, which gives a very good finish to the work. Other rates of feed may be fitted to the machine if desired, which will enable a propeller to be shaped in 70 minutes with a slightly coarser finish. A four-bladed propeller is cut in exactly double these times.

One man can quite easily operate three machines, and is, indeed, doing so in several shops in the country, and keeping each machine constantly working.

The machine is of exceedingly simple construction and equally simple to operate. In fact, there is very little operating required as the machine is entirely automatic and merely requires starting and stopping as each blade is cut, and the work placing in and out of the machine.

The method of setting the work in the machine is also simple, but very effective, and serves also for indexing the blades. The block is built up in the usual way, but with the bottom lamina left 4¾ ins. longer on each blade. On a centre line a 1-in. diameter hole is drilled in this extension piece in each blade to a template.

The centre hole may either be bored out 1½ in. to suit the mandrel of the machine, or bored out the finished size. If the latter method is adopted, it is necessary to use a bush to fit it, with a 1½-in. diameter hole for the mandrel.

The propeller block is placed over the mandrel of the machine and sits on a face plate and is locked by a screwed nut. The extended tip fits over a steady pin and is locked by a hand nut.

The principle upon which the machine is based consists of forming a propeller blade by causing a roller to pass over the surface of an "original," the path followed by this roller imparting a similar motion to the cutter-arm as it passes over the work, as to cause the cutter itself to follow an exactly similar path.

The bed consists of a long casting, with machined ways, upon which a carriage is mounted. This carriage supports upon machined ways, upon its upper face, a reciprocating headstock worked by a crank motion. Upon this headstock are pivoted the cutter block and copy roller arms, and connected at their ends remote from the cutting tool by an adjustable link. The arms are balanced by a spring so that just sufficient weight is on the original as to keep the cutters in contact with the work.

The cutter block consists of twelve cutters of special shape, six cutters being on the front side of the block and six on the back side, so that the machine will cut with equal facility in either direction. The speed of the cutter block is 4,200 r.p.m., and the spindle on which it is mounted runs in ball bearings. By means of a flat belt running over a two-step pulley, mounted on ball bearings and carried by a bracket fixed to the sliding headstock, the drive is carried to the cutter block.

A second flat belt, running vertically downwards over guide pulleys, couples the two-step pulley with the driving pulley, which is fixed, and traverses with the carriage along a splined shaft. This shaft carries at one end a pair of fast and loose pulleys and also a pulley for driving by means of crossed and open belts the carriage-feed mechanism. Steel reduction gearing, contained in a gear case, connects the driven pulleys of this feed mechanism with driving shaft for giving the reciprocating motion to the headstock on the carriage, and also for giving the longitudinal traverse to the carriage by means of a screw.

All gearing is of steel. Two stout horizontal turned bars, mounted in a pair of brackets, are used to carry the mandrels and face plate for supporting the work and the original or copy. The method of mounting the propeller block upon the mandrel and the steady pin at its opposite end has already been explained, and the original is mounted in exactly the same manner. It will be noticed that the original roller rests upon a wooden platform, the function of which is to provide a support for the roller on leaving the surface of the original.

The original consists of a wooden block shaped on one side only, exactly as the finished blade for the face side, and a similar block for the back side. By adopting this method a very stiff original is obtained, which can be quickly made by the manufacturer in his own shop.

The wooden platforms are fixed to quadrant brackets mounted on the original supporting bar, and can be locked in any suitable position. These platforms are shaped to suit the edge and faces of the propeller in order to give a smooth and easy motion to the roller-arm as it passes backwards and forwards over the original.

Owing to the variable shape of propellers, a motion is provided so that the original and the propeller block are tilted simultaneously by means of parallel links, and a worm and wormwheel motion, operated by hand wheel in order to facilitate the original roller in its traverse, particularly close to the hub.

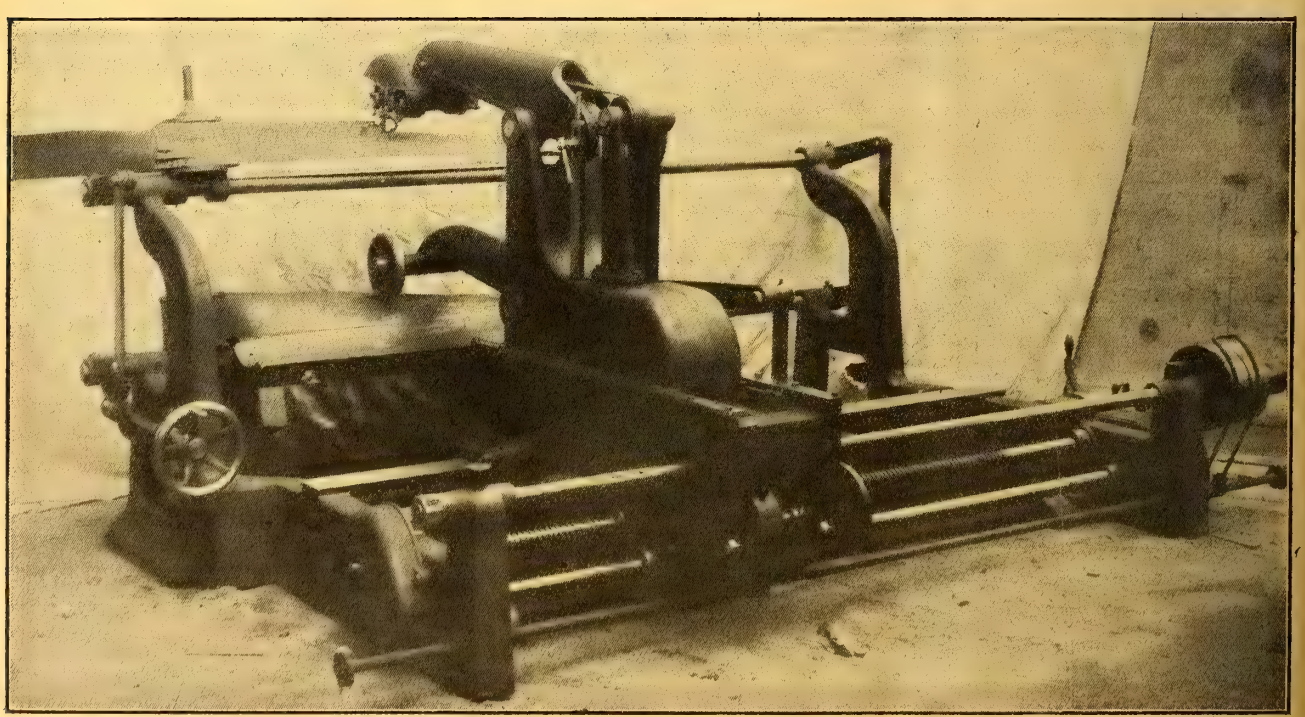
The machine is made in two sizes, viz:—To take propellers up to 12 ft. and 14 ft. diameter, both of which will take work 9½ in. through the hub and 16-in. width of blade.

The actual amount of time saved depends, of course, upon the size of the propeller, but taking the various figures given by propeller workers, the average is well over 10 hours on a two-bladed propeller and in some cases is as much as 14 hours.

The actual amount of time saved by one machine resolves itself then into a simple sum, thus:—Assuming a 60-hour week, and for easy reckoning assume 2 hours for a 10-ft. two-bladed propeller. Time saved:—60 multiplied by 10, divided by 2, equals 300 hours per week.

Messrs. Wadkin and Co. will be pleased to demonstrate this machine at their works, or to arrange for the machine to be seen at the works of one of their numerous customers, or to supply a sample blade showing just what the machine is capable of accomplishing, and to supply a list of the users to any propeller maker who is interested in the machine and who desires to increase his output considerably, without additional hand labour.

Large extensions have recently taken place at Messrs. Wadkin's factory, especially to deal with this and other special woodworking machinery which they manufacture for the production of aircraft, and extensive arrangements are being made still further to accelerate their output in order to cope with the increasing demand for this class of machinery.



TO INCREASE OUTPUT.—A Wadkin Propeller-shaper. The model blade is shown in position below, and, as the roller runs over it, the cutter on the end of the parallel arm above follows exactly the movements of the roller.

THE PATENTS INDEX.

The subjoined list of inventions has been specially compiled by The Aeroplane from the current Official Patents Records.

Patent Applications.

Aeronautical Instrument Co. Balloons. No. 12899. Sept. 8th.
Ashworth, J. Aeroplanes. No. 12673. Sept. 4th.
British Aeroplane Varnish Co. Dopes or varnishes for aircraft. No. 12807. Sept. 6th.
Brown, E. E. Metal construction for aircraft. No. 12849. Sept. 7th.
Cleaver, H. C. Propellers for aircraft. No. 12921. Sept. 8th.
Connor, T. J. Flying-machines. No. 12755. Sept. 5th.
Jones, W. H. Rotary internal-combustion engines and propellers for aircraft, etc. No. 12672. Sept. 3rd.
Newton, J. M. Projectile for anti-aircraft guns. No. 12822. Sept. 7th.
Ratcliffe, J. R. Clinometers for aeroplanes. No. 12875. Sept. 8th.
Ravier, S. L. Aeroplanes. No. 12914. Sept. 8th.
Rowles, S. G. Gravity-controlled level-indicator for aircraft, submarines, etc. No. 12758. Sept. 6th.
Rupene, A. Aeroplanes. No. 12784. Sept. 6th.
Taylor, W. Apparatus for condensing and retaining compressed or liquefied gas in a receiver, for use with motor-vehicles, aeroplanes, motor-boats, etc. No. 12820. Sept. 7th.
Valda, A. H. Construction and working of aeroplanes. No. 12810. Sept. 6th.
Vickers, Ltd. Aircraft gun mountings. No. 12904. Sept. 8th.
Vickers, Ltd. Means for controlling fire of guns carried by aircraft. No. 12908. Sept. 8th.
Vickers, Ltd. Means for controlling fire of guns carried by aircraft. No. 12909. Sept. 8th.
Vickers, Ltd. Means for controlling fire of guns carried by aircraft. No. 12910. Sept. 8th.
Woosnam, A. Aeroplanes. No. 12742. Sept. 5th.

Complete Specifications Accepted, Prints of which can be obtained on and after Sept. 27th, 1917.

109,081. August 28th, 1916. Martin, J. V. Aircraft wing structures.
109,146. Nov. 1st, 1916. Sopwith Aviation Co., and Sopwith, T. Construction and arrangement of axle for aeroplanes and the like.
109,202. Jan. 29th, 1917. Gilbody, F. H., and Durrant, G. Brackets for pulleys, levers, or the like, such as are used on aircraft, motor-cars, and many other purposes.

Abridgments of recently published Specifications.

107,674. Aeronautics. Power, R. F., Doveridge, Derby.

Steering and Balancing.—In dual-control mechanism for aeroplanes, in which the observer thrusts his operating-lever downwards into a socket in order to take over the control, means are provided whereby this downward movement of his lever renders the pilot's control gear inoperative and also whereby the pilot may resume the control at any time. The pilot's control lever A is ball-jointed at A^2 to a portion sliding in the usual socket A^1, and the observer's lever B is arranged to slide in a similar socket B^1, the sockets A^1, B^1 being pivoted at A^3, B^2 to a longitudinal rotary shaft E and connected together by a rod C. A lever F pivoted midway at F^1 passes through slots in the sockets A^1, B^1 and engages under the levers A, B, so that, when the observer takes over the control by removing a pin F^2 and pushing his lever B into the socket B^1, the pilot's lever A is raised until the ball joint becomes clear of the socket, thus preventing the pilot's body from fouling the control. The pilot's rudder bar G is mounted on a pivot G^1, which is normally depressed through a fulcrum hole G^5, as shown in Fig. 5, by a plunger H attached to the lever F, but is raised therefrom, as

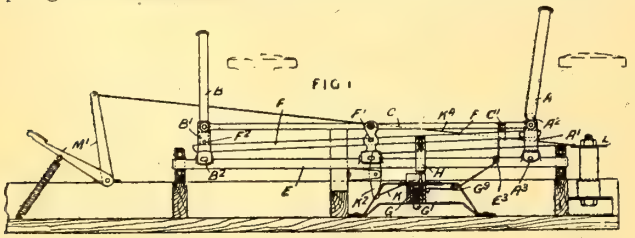


FIG 1

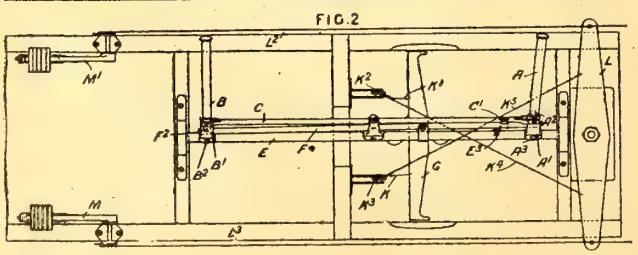


FIG 2

shown in Fig. 1, by a spring G^4 when the observer takes over the control, thus allowing the rudder bar G to slide freely when the observer actuates the rudder lever L by means of his pedals M, M^1, and wires L^2, L^3. The rudder bar G is connected by wires K, K^1, levers K^2, K^3, and wires K^4, K^5 to the lever L. The pilot may regain control by replacing his lever A in the socket A^1, the rudder bar G being at the same time drawn back into position by a cable connected to the lever F and passing over pulleys C^1, E^3, G^3, or by a spring. The socket B^1 is made deep enough to allow the lever B to be partly inserted for dual control for instructional purposes.

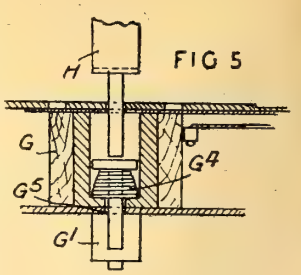
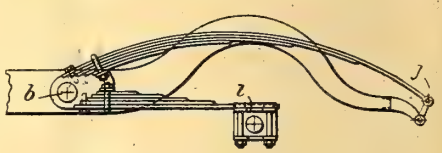


FIG 5

107,750. Vehicle Springs. Pelterie, R. Esnault-, 11, Rue de Milan, Paris. Addition to 2299/15. Convention date, July 6th, 1916.

Cantilever springs of the type described in the parent Specification have the point of suspension *i* of the axle almost in the line of, but slightly below, the points of attachment *b*, *j* of the upper springs.



THE AERONAUTICAL SOCIETY OF GREAT BRITAIN.

New Members.—The following have been elected members of the Society in the various grades:—

Fellow.—Harris Booth, B.A., A.M.Inst.C.E., F.R.Met.Soc., A.F.Ae.S.

Associate Fellow.—Alan Ernest Leofric Chorlton, C.B.E., M.Inst.C.E., M.Inst.Mech.E., M.Inst.E.E., M.Sc.
Allan Lindsay Anderson.
Granville Eastwood Bradshaw.
Alfred John Sutton Pippard, M.Sc., A.M.Inst.C.E.
Capt. Hon. W. F. Forbes Sempill, R.F.C.
Harold Lord.

Member.—G. D. I. Seneviratne.
Lt.-Col. R. Mandeville Rodwell, R.F.C.
Comdr. William Bernard Murphy, R.N.
Arthur Francis Martin.
Howard Edward Latimer Voight.
William Elderton.

Associate Member.—Lt. B. Hackforth, R.N.A.S.
Major Leveson Scarth.

Student.—David Maxwell Buist.

7, Albemarle Street, W. W. Barnard Faraday, Sec.

THE NORTHAMPTON POLYTECHNIC INSTITUTE.

Full day courses in the theory and practice of civil, mechanical, and electrical engineering will commence on Monday, October 1st, 1917, at the Northampton Polytechnic Institute, St. John's Street, E.C.1.

The courses in civil and mechanical engineering include specialisation in automobile and aeronautical engineering, and those in electrical engineering include specialisation in radio-telegraphy.

The entrance examinations are on Tuesday and Wednesday, September 25th and 26th, 1917.

These courses include periods spent in commercial workshops, and extend over four years. They also prepare for the degree of B.Sc., in engineering at the University of London. Fees, £15 or £11 per annum. Three entrance scholarships of the value of £52 each will be offered for competition at the entrance examination in September, 1917.

The Principal of the Institute is Dr. R. Mullineux Walmsley, D.Sc. The system of education is of the highest quality, and the classes can be strongly recommended to all who wish to learn.

AN AMERICAN TRADE NOTE.

According to a report in the "Aerial Age Weekly" for August 20th, the accuracy of which cannot be guaranteed, plans for the manufacture of powerful British-type bombing airships (*sic*), to be used by the American Flying Corps, were discussed at a conference between Mr. W. H. Workman, a "British aero-expert," and members of the Aircraft Production Board. "One machine of the type (the twin-motored Handley Page) which it is proposed to manufacture, has made a flight from London to Rome."

(*Continued from page* 800.)

Two of our machines are missing.

Sept. 14th, 9.3 p.m.—On the 13th inst. the weather was again very unfavourable for aerial observation. Eighty bombs were dropped by our aeroplanes on the enemy's billets east of Lens, and his troops in the open and in their trenches were barraged by machine-gun fire from a low altitude.

There was a certain amount of fighting under difficult conditions.

Three of our machines are missing.

Sept. 15th, 9.25 p.m.—On the 14th inst. the cloudy weather continued, with a strong west wind, making artillery observation difficult and greatly favouring the enemy's machines in combats.

Eleven heavy bombs were dropped by us on the railway station north of Charleroi and 75 bombs on railway stations, billets, and encampments nearer the lines.

Three enemy machines were brought down, one falling behind our lines, and six driven down out of control.

Four of our machines are missing.

Sept. 16th, 9.9 p.m.—On the 15th inst. there was no improvement in the weather, and a strong west wind still rendered difficult the return of our machines from bombing raids and from fighting behind the enemy's lines.

Artillery and photographic work was continued, and three tons of bombs were dropped on two hostile aerodromes east of Courtrai, on an aerodrome and an ammunition dump north-east of Cambrai, and on hostile billets and hutments.

Six German machines were brought down in air fighting and two driven down out of control.

Four of our machines are missing.

Sept. 17th, 9.19 p.m.—On the 16th inst. visibility improved, and a good deal of successful artillery work and photography was accomplished.

During the fine intervals enemy aircraft were active and were again greatly favoured by the strong west wind. In the course of the morning hostile machines dropped 50 bombs behind our lines. Very little damage was done.

Our aeroplanes dropped 143 bombs on a German aerodrome and on hostile billets and fired many thousand rounds from their machine-guns at various targets on the ground.

In particular a body of 2,000 German infantry were engaged with machine-gun fire from a height of 100 ft. and scattered.

Six German aeroplanes were brought down in combat and four others were driven down out of control. In addition one hostile machine was shot down in our lines by anti-aircraft gunfire.

Eight of our aeroplanes are missing.

War Office Communiqué.

Sept. 15th.—The G.O.C. the British Forces in Macedonia reports:—

During the past week our aeroplanes have bombed the enemy's encampments and dumps at Rupel, Vetrina, and Cernista (Struma front), causing considerable damage.

The Casualty List.

Reported Sept 12th.

Killed.—Hardwick-Terry, Capt. L. A., R.E., attd. R.F.C.

Previously reported Missing, now reported Killed.—Preston, Lt. R. A., M.C., Linc. R., attd. R.F.C.

Previously reported Wounded, now reported Died of Wounds.—Watt, Sec. Lt. N. L., Cav., Spec. Res., attd. R.F.C.

Wounded.—Beatty, Sec. Lt. C. W., R.F.C.
Campbell, Sec. Lt. A. W., R.F.C.
Phillips, Sec. Lt. V., R.F.C.
Thomas, Lt. F. W. H., Yeo. and R.F.C.
Wilcox, Sec. Lt. S. L., R.F.C.

Missing.—Bacon, Sec. Lt. E. S., R.F.A. and R.F.C.
Kember, Sec. Lt. W., Lan. Fus. and R.F.C.
Madge, Lt. J. B. C., R.F.C.

Previously reported Missing, now reported Prisoner in German Hands.—Colledge, Sec. Lt. G., Yeo. and R.F.C.

Reported Sept. 13th.

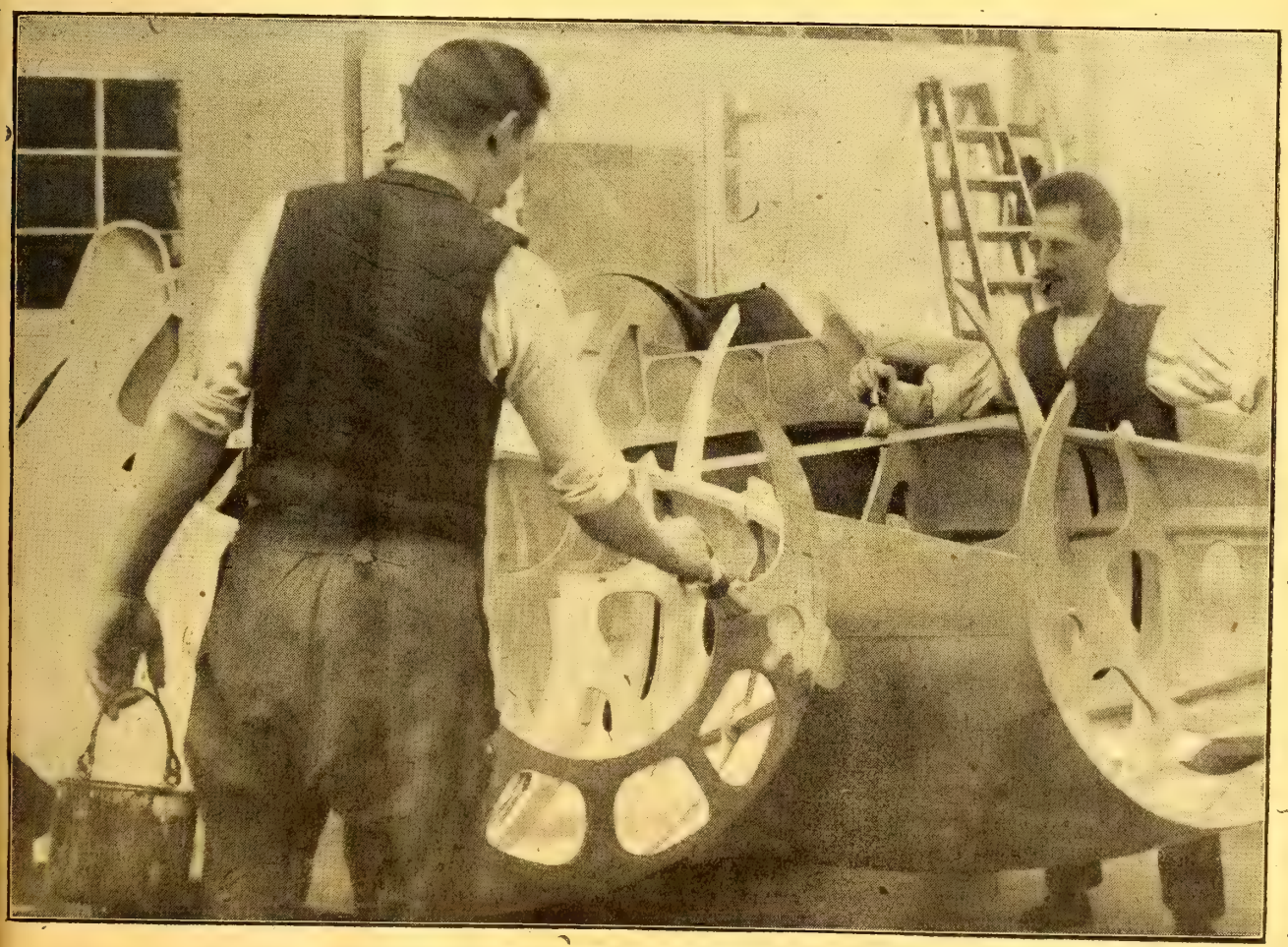
Previously reported Missing, now reported Killed.—Fullalove, Sec. Lt. G. Y., R.F.C.

Died of Wounds.—Gordon-Kidd, Capt. A L., D.S.O., R.F.C.

Missing.—Sant, Sec. Lt. E. M., Essex R., attd. R.F.C.

Previously reported Wounded and Prisoner, now reported Died of Wounds as Prisoner in German Hands.—Middleton, Lt. J. R., R.F.C.

Previously reported Missing, now reported Prisoners in German Hands.—Chapman, Sec. Lt. J., High. L.I., attd. R.F.C.
Henderson, Sec. Lt. J. F., R.F.C.
Jeff, Sec. Lt. R. N. W., R.F.C.
Moore, Lt. M., Y. and L. R., attd. R.F.C.
Read, Sec. Lt. L., R.F.C.
Tinney, Sec. Lt. H. G., R.F.C.



GERMAN AEROPLANES IN THE MAKING.—Varnishing the fore-end of Albatros fuselages.

Australian Force.—Wounded.—Wilson, Sec. Lt. G. C. Fl. C.
Previously reported Missing, now reported Wounded and Prisoner in German Hands.—Norvill, Lt. V. A., R.F.C.
Previously reported Missing, now reported Prisoner in German Hands.—Wearne, Sec. Lt. A., Fl. C.

Reported Sept. 14th.

Killed.—Cleghorn, Capt. H. S., R.E. and R.F.C.
Wounded.—Burgess, Sec. Lt. V. W., R.F.C.
Bush, Lt. R. F. L., R.F.A., attd. R.F.C.
Willmott, Lt. S., R.F.A., attd. R.F.C.
Missing.—Bird, Lt. A. F., Norf. R. and R.F.C.
McDonald, Lt. K. W., R.E. and R.F.C.
Spencer, Sec. Lt. W. A. L., R.F.C.
Williams, Lt. S. W., Essex R. and R.F.C.

Reported Sept. 15th.

Killed.—Clegg, Lt. R. L., Lan. Fus., attd. R.F.C.
Martin, Lt. R., Yeo., attd. R.F.C.
Wounded.—Alexander, Sec. Lt. B. S., Leic. R., attd. R.F.C.
Baragar, Lt. F. B., R.F.C.
Cleobury, Sec. Lt. S., S. Staff. R., attd. R.F.C.
Sotham, Sec. Lt. R. C., R.W. Kent R., attd. R.F.C.
Ward, Lt. G. F., R.F.C.
Missing.—Heywood, Lt. A. T., R.F.C.
Pickett, Sec. Lt. A. C., R.F.C.
Pickstone, Sec. Lt. C., R.F.C.
Pullen, Lt. C. J., R.G.A. and R.F.C.
New Zealand Force.—Previously reported Missing, now reported Killed.—Masters, Sec. Lt. G., Pioneers, attd. R.F.C.

Reported Sept. 17th.

Killed.—Payne, Sec. Lt. W. S. L., M.C., R.G.A., attd. R.F.C.
Sandys, Lt. W. E., R.F.C.
Wray, Sec. Lt. T. E., R.F.C.
Previously reported Missing, now reported Killed.—Thompson, Sec. Lt. W. G., Suff. R. and R.F.C.
Died of Wounds.—Williams, Sec. Lt. A. T., R. Welsh Fus., attd. R.F.C.
Wounded.—Moore, Sec. Lt. G. N., R.F.C.
Simmance, Lt. J. A., R.W. Surr. R., attd. R.F.C.
Sutton, Capt. B. E., D.S.O., M.C., Yeo. and R.F.C.
Missing.—Barber, Lt. B. K. B., North'd Fus., attd. R.F.C.
Binns, Sec. Lt. J. H., R.F.C.
Harper, Lt. S. A., M.C., Ches. R., attd. R.F.C.
Robinson, Sec. Lt. E. D. S., R.F.C.
Scarborough, Sec. Lt. F., R.F.A., attd. R.F.C.
Sharp, Capt. C. C., R.F.C.
Wightman, Sec. Lt. J. F., R.F.C.
Previously reported Missing, now reported Died of Wounds as Prisoner in German Hands.—Hay, Lt. R. B., M.C., W. Yorks. R., attd. R.F.C.
Previously reported Missing, now reported Prisoners in German Hands.—Coombs, Sec. Lt. V. C., R.F.C.
Hill, Sec. Lt. A. B., R.F.C. Fl. C.
Australian Force.—Wounded.—Smith, Sec. Lt. R. M., M.C.

Reported Sept. 18th.

Killed.—Holman, Lt. C. G., K.O.S.B., attd. R.F.C.
Shields, Lt. W., Manch. R., attd. R.F.C.
Died of Wounds.—Harding, Lt. S. A., R.F.C.
Wounded.—Craig, Sec. Lt. A. D. K., R.F.C.
Forster, Sec. Lt. F., R.F.C.
Missing.—Macniven, Lt. A. O., High. L.I. and R.F.C.
Huggard, Sec. Lt. J. C., R.F.C.
Neill, Lt. J. W. F., R. Scots., attd. R.F.C.
Webster, Sec. Lt. T. M., R.F.C.
Previously reported Prisoner, now reported Wounded and Prisoner in German Hands.—French, Lt. G. S., Cambs. R. and R.F.C.
Canadian Contingent.—Wounded.—Campbell, Lt. W. A., Cent. Ont. R., attd. R.F.C.
Guillon, Lt. G. M., Que. R., attd. R.F.C.
Pannill, Lt. A. H., M.C., E. Ont. R., attd. R.F.C.
Previously reported Missing, now reported Died as Prisoner in German Hands.—Drummond, Lt. L., Engrs., attd. R.F.C.
Previously reported Missing, now reported Prisoners in German Hands.—Bean, Lt. C. A. S., B.C. R., attd. R.F.C.
MacKay, Lt. W. B., Cent. Ont. R., attd. R.F.C.

Casualties among Warrant Officers, N.C.O.'s and Men.
The dates are those of the official list.

Killed.

Sept. 3rd.—R.F.C.—Bennetts 30163 2nd Cl. Air Mech. H. V. (Lewisham, S.E.).
Sept. 8th.—Webb 87713 2nd Cl. Air Mech. F. A. (Ramsgate).

Died of Wounds.

Sept. 3rd.—R.F.C.—Brown 15108 1st Cl. Air Mech. W. F. (New Cross, S.E.).

Died.

Sept. 3rd.—R.F.C.—Kitchingman 38245 2nd Cl. Air Mech. H. R. (Islington, N.).

Wounded.

Sept. 3rd.—R.F.C.—Goodall 15912 1st Cl. Air Mech. S. H. (Walthamstow, E.); Harvey-Bathurst 49181 Sgt. A. R. (Piccadilly, W.); Velati 8551 1st Cl. Air Mech. H. C. (Clapham, S.W.).
Sept. 8th.—Sunshall 9899 1st Cl. Air Mech. K. W. (London, W.C.); Clark 7170 Sgt. W. R. (Kingston, Jamaica).

Missing.

Sept. 6th.—Rifle Brigade, attd. R.F.C.—Davis 1756 H. (Birmingham).
Previously reported Missing, now reported Prisoners of War in German Hands.
Sept. 3rd.—R.F.C.—Harris 87534 2nd Cl. Air Mech. W. (Ironville); Walker 6757 Sgt. T. (Barwick-in-Elmet).

Australian Imperial Force.

Died.

Sept. 7th.—A.F.C.—Sloane 694 W. D.

PERSONAL NOTICES.

Deaths.

ANGOOD.—Second Lieut. Percival G. Angood, R.F.C., was killed in a flying accident near Chippenham, Wiltshire, on Sept. 11th. His machine nose-dived, and fell into a tree.

ARNOLD.—Sec. Lt. H. E. Arnold, R.F.C., who was reported missing on Dec. 26th, 1916, and is now officially reported to have died of wounds on that date, was the only son of Mr. and Mrs. H. Arnold, King's Cross, N.

ASTON.—Sec. Lt. Aston, whose death was announced last week, was the second son of Mr. and Mrs. F. W. Aston, of Grenville, Durlston Road, Kingston, was educated at Tiffins School, and at the outbreak of war enlisted in the R.N.A.S. After becoming a Chief Petty Officer, he was granted a commission in the R.F.C. He was 28 years of age.

BANNATYNE.—Major E. J. Bannatyne, D.S.O., R.F.C., died on Sept. 11th at the Cirencester Hospital from the effects of an accident he met with on August 30th.

During a flight his machine caught fire, but Major Bannatyne stuck to the controls and brought the aeroplane within 40 or 50 feet of the ground. He was then driven by the flames from his seat, crawled along the tail, and jumped clear, fortunately falling on some newly-dug ground.

He was badly burned and sustained fractures of the arm and collar-bone. He rallied well from the shock, but tetanus supervened, and to this he succumbed.

Major Bannatyne, D.S.O., Hussars and R.F.C., was the only son of Mr. and Mrs. A. E. Bannatyne, of Glen Bevan, Croom, Co. Limerick. He was 26 years of age, and was educated at Wellington College and Caius College, Cambridge. He joined the 19th Hussars in 1913, and went to France with that regiment in August, 1914. He returned to England in November of the same year on sick leave, during which time he qualified for his flying certificate.

He was in the Experimental Flight at Upavon, until February, 1916, when he was sent to Egypt.

He was given a squadron at Ismailia, and proceeded later to El Arish. He returned to England last June.

He was mentioned in dispatches for his good work in the operations against the Sultan of Darfur, and for subsequent good service with the Army in Egypt. Besides being an efficient officer, he was highly esteemed by all who served with him, and his death will be deeply regretted, especially under such circumstances.

BILLING.—Sec. Lieut. Kitto Billing, R.F.C., an Australian aviator, was killed on Sept. 14th by falling from an aeroplane while flying near Birmingham. He ascended alone in the machine, and having attained a height of about 2,000 ft. looped the loop several times. He was then seen to fall from the aeroplane, which righted itself, but subsequently crashed in a wood at Water Orton.

At the inquest held by the Warwickshire Coroner on Sept. 17th, Major Sheldon said that Mr. Billing came to the aerodrome a month ago with previous flying experience gained in Canada. He had passed through the school, and, having obtained his pilot's certificate, was due the next day to leave the ground to go to another station for a course of aerial gunnery.

He was having a final fly round, and ascended alone in a two-seater. The witness saw the aeroplane descend at a very steep angle from a height of 1,500 to 2,000 ft. When it reached the ground no aviator was to be found, and the body was not discovered until next day. His theory was that when in the air the pilot received a sudden jerk, which, by bringing undue pressure on the belt, broke the pin and caused the belt to fly open, and released the pilot's body.

A private resident in the locality said he saw the pilot fall from the machine.

Capt. Wilson, R.A.M.C., said there was a fracture of the base of the skull. The officer probably died before he reached the ground, but preconceived opinions had been shattered by recent experiences. An officer, who fell 3,000 ft., assured the witness that he retained consciousness until 200 ft. from the ground.

A verdict of accidental death was returned.

BISHOP.—Second Lieut. Bernard Bennett Bishop, Duke of

Cornwall's Light Infantry, attd. R.F.C. (killed in action on Sept. 9th), was eldest son of Engineer Captain Bishop, R.N., and of Mrs. Bishop, of Saltash. He had served in the ranks of the London Regiment before getting his commision in December, 1917.

BUSBY.—Sec. Lt. Harry Eldred Busby, R.F.C., aged 19, of Wellington Road, Hampton Wick, was killed on Sept. 11th. His machine, while descending from a height of 400 ft., suddenly nose-dived, and the pilot was instantaneously killed. It was said to be his first "solo" flight.

It was suggested at the inquest at Hendon on Sept. 15th that he might have fainted. The machine had been used the same day, and there had been no difficulty in controlling it. A verdict of accidental death was returned, and sympathy was expressed by the Coroner and jury with his parents, who live at Wellington Road, Hampton Hill.

BUXTON.—Sec. Lt. George Barclay Buxton, Norfolk Regt., attached R.F.C., whose death was reported last week in this paper, was last seen flying east, attacking four enemy machines well over the German lines, having previously accounted for one. He was 24 years of age, and the third son of the Rev. Barclay F. Buxton, a missionary in Japan, and late of Widbury, Ware. When war broke out he was in British East Africa, and joined the King's African Rifles as a Scout. Later he returned to England, and after two months' training as an officer joined the Norfolks on active service. For nine months he was A.D.C. to Major-General Hare. Hearing of the need of R.F.C. pilots he returned to England, and quickly won his pilot's wings. He went out to France in July, 1917. One writes to say:—"Though he has only been here a short time he is a great favourite, and is considered a most capable pilot." He was educated at St. Andrew's School, Southborough, and at Repton. His eldest brother Murray, Norfolk Regt., was severely wounded at the battle of Gaza, and won the Military Cross, which his younger brother, Capt. Godfrey Buxton, Duke of Wellington's Regt., has also received.

CLEGHORN.—Capt. Herbert Stuart Cleghorn, R.E. and R.F.C., who was killed in action on Sept. 2nd, was the third son of John and Margaret Cleghorn, Clifton, Alyth. He was 26 years of age.

COLE.—Sec. Lt. Maxwell G. Cole, R.F.C., who was reported missing on May 18th, and is now officially reported killed, was the youngest son of W. H. Cole, Esq., J.P., and Mrs. Cole, of Bourne House, Brimscombe, Glos. He was 18 years of age.

CRONHELM.—Lt. Arthur Geoffrey Cronhelm, London Regt. and R.F.C., reported accidentally killed, was the youngest son of Mr. and Mrs. Theodore Cronhelm, of Craigend, Howth, Co. Dublin, and was educated at Christ's Hospital, Horsham, where he was a member of the Cadet Corps and the Bisley Reserve. He had been in Chile, but returned home on the outbreak of the war, and in February, 1915, obtained his commission. He fought in the battles of Neuve Chapelle, Festubert, and Loos, being wounded in the last. Subsequently, he saw service on two other fronts, and recently became attached to the R.F.C. In November, 1916, he married Gladys, daughter of Mr. David M. Steen, formerly of the Ceylon Civil Service.

CROSBIE.—Lt. John Colin Crosbie, R.G.A., attached R.F.C., who died on Sept. 7th, was the only son of Arthur and Agnes Crosbie, Northlands, Hadley & Barnet.

DOWNING.—Lieut. George Guy Barry Downing, R.F.C., whose death was announced last week, was the third and youngest son of Mr. and Mrs. G. C. Downing, of Beverley, Llanishen. He was educated at Waynflete, near Reading (Rev. J. H. Wilkinson), and at Charterhouse (Hodgsonsites, Mr. T. E. Page), where he was a member of the cadet corps and took a great interest in the scouts. After leaving Charterhouse he studied art at the Slade School, London. In August, 1914, he joined the Old Public School Boys' Training Camp at Tidworth Pennings, was recommended for a commission, and posted to the Welch Regiment. He applied for transfer to the Royal Flying Corps, but accompanied his regiment to France and was wounded on September 25th, 1915, at the Battle of Loos.

He was subsequently transferred to the Royal Flying Corps, and after the usual training was in July 1916, sent to the front, where on September 2nd, 1916, while flying over the German lines his machine was seriously damaged by German anti-aircraft gun fire and he was wounded. In these circumstances, attacked by two German machines, he succeeded in driving them off, and in landing within the French lines. He was sent home, and when recovering from his wounds had a severe attack of diphtheria.

Certified fit for light duty in March last he subsequently acted as instructor at aerodromes in this country. He was recently under orders for the front, but these were countermanded, and he was ordered to return to Scotland as an officer of a training school, where he had been only a few days when the accident happened. He had considerable talent as an artist; a number of his drawings have been reproduced in the illustrated magazine "Colour," and he had every prospect of a successful career. He married in April, 1915, Miss E. E. Evans, youngest daughter of Mr. Edwin Evans, senior, and leaves a son.

FAY.—At Weybridge, on Sept. 17th, an inquest was held on an air mechanic named John Fay, who was knocked down by an aeroplane which was ascending at Brooklands. Upon reaching an height of 60ft. the engine stopped, causing the machine to dash along a short distance until its progress was stopped by sheds, into which it crashed. One of the planes struck Fay, fracturing his skull. He was fetching petrol to fill the tanks of his own aeroplane. The jury returned a verdict of accidental death. Fay was a Manchester man and leaves a widow.

FITZHERBERT.—Capt. W. W. Fitzherbert, Royal Sussex Regt., attached R.F.C., who was reported missing on July 7th, and is now unofficially reported killed on that date, was the third son of the late W. A. Fitzherbert, of The Hutt, Wellington, New Zealand, and of Mrs. W. A. Fitzherbert, now residing at Saxes Plat, Rudgwick, Sussex, and nephew of Mr. and Mrs. S. T. Fitzherbert, of 17, Chepstow Villas, W.11.

GORDON-KIDD.—Capt. Arthur Lionel Gordon-Kidd, D.S.O., R.F.C. (died of wounds), passed from the 4th Dragoon Guards into the R.F.C. He was appointed a Companion of the Distinguished Service Order in August, 1916, for conspicuous gallantry, skill, and determination.

According to the official account: "On one occasion he dived his machine from a height of 7,500 ft. to 900 ft., and placed a bomb on the enemy's ammunition train, which set it on fire, and blocked the line. A few days afterwards he performed another very hazardous undertaking well within the enemy's lines, whilst exposed the whole time to all descriptions of heavy fire." In October, 1916, he was promoted Captain and Flight Commander.

HARDWICK-TERRY.—Capt. L. A. Hardwick-Terry, Royal Engineers, Flt. Comdr., R.F.C., was killed on August 31st, when practising at a height of 2,000 ft. In making a vertical dive with the engine full on, one of the wings of his aeroplane became detached, and he crashed into a wood. The machine was smashed, but Capt. Hardwick-Terry's body was found without even a cut. On the arrival of his comrades a few minutes later, however, life was extinct.

Capt. Hardwick-Terry was the only child of Mr. and Mrs. E. Hardwick-Terry, of Urquhart, Berkhamsted, Herts, and a grandson of the scientist, Alfred Senior Merry. He was educated at Merchant Taylors and Berkhamsted, and from childhood showed remarkable aptitude for science and engineering. He joined the Inns of Court O.T.C., and obtained his commission in the Royal Engineers in February, 1915. After seeing service with the Anzacs in Egypt, he volunteered on his return to England for the R.F.C., and at the time of his death had been flying at the front for nearly eight months. Capt. Hardwick-Terry was 21 years of age.

JARDINE.—While flying at Montrose on Sept. 13th Sec. Lieut. Roland Jardine, Scots Greys, attd. R.F.C., was killed. He had just ascended but, turning too quickly, his machine nose-dived.

Sec. Lt. Ronald James Jardine was the only son of Mr. and Mrs. Jardine, of Jardine Hall, Lockerbie, N.B. He was educated at Mr. Hawtree's School, Westgate-on-Sea, and afterwards at Eton. Intended for a military career, he proceeded to Sandhurst, and, on passing the necessary examination received a commission in the Royal Scots Greys, on August 15th, 1914. Subsequently, he transferred to the Flying Corps. He was 24 years of age. He was a nephew of Mr. Charles Bright, the well known engineer, and a member of the Air Enquiry Committee.

LE GALLAIS.—At an inquest at Faversham on Sept. 17th on the body of Lieut. Reginald Le Gallais, R.F.C., who was killed while flying on Sept. 15th, another officer who witnessed the fall said he thought an interplane strut broke, causing the left-hand wings to collapse, and the machine to fall out of control. Mr. Le Gallais, who had flown a good deal in France, was 19 years of age, and belonged to Jersey.

LEDGER.—Lieut. Aimé Antoine Ledger, Canadian Infantry, attd. R.F.C., was killed at Rustington, near Littlehampton, on Sept. 11th.

His machine was observed to be flying very low, close to the sea, when some part of the aeroplane broke and fell. He appeared to be trying to land, but the machine fell into the sea some 400 yards from the shore. Mr. Ledger got clear of the wreckage and tried to swim ashore, but he suddenly threw up his hands and disappeared. Unfortunately no assistance was at hand at the moment, and when motor-boats and patrol vessels arrived they could find no trace of the aviator. The machine was towed ashore a complete wreck. The body has been recovered.

MATHESON.—Lt. Alexander Perceval Matheson Matheson, A.S.C., Actg. Flt. Comdr., R.F.C., whose death was announced last week, was the grandson of the late Sir Alexander Matheson, Bart., of Lochalsh, whom he would eventually have succeeded.

Mr. Matheson was educated at Oundle, intending to take up engineering as a profession, but on leaving school he entered the Ontario Agricultural College, Guelph, Canada, taking a four years' course in farming and forestry.

When war was declared he returned to Littlehampton, and

received a commission in the A.S.C. two weeks after his arrival. In November, 1916, he was attached R.F.C. as pilot, and in February left for the front with his squadron, and was stated to be one of the bravest and best pilots in the squadron.

MUIR.—The Grantham district coroner was notified on Sept. 13th of the death of Capt. S. K. Muir, R.F.C., who was killed while flying. His home was in Melbourne, Australia.

PALMER.—At Lincoln, on Sept. 17th, an inquest was held on the body of Lieut. William Saul Hudson Palmer, R.F.C., who fell while flying in Lincolnshire. On reaching the ground the machine burst into flames, and before the aviator could be released he was severely burnt. He died from shock four hours later. The evidence showed that Mr. Palmer, who was 19 years of age, was a keen aviator. This was his first flight alone, though he had previously had entire control when accompanied by his instructor. It was further stated that the left wing of the aeroplane dropped and the machine fell. The jury returned a verdict that death was purely accidental.

SPEAR.—Sec. Lieut. Norman Victor Spear, R.F.C., whose death was announced recently, was born in Norway and educated at Askes School, Hampstead, where he won the silver medal. At the outbreak of the war he was employed in the office of the secretary of the Institution of Civil Engineers. He joined the London Scottish in 1911. Not having fully recovered from an operation he was prevented from going to France with his battalion, but was passed for service and rejoined with a draft in November, 1914. He was a sergeant in the Scouts section when he was severely wounded at Loos, on September 25th, 1915, and was awarded the Military Medal.

On recovery he was recommended by his commanding officer for a commission, and in September, 1916, he was gazetted to the Royal Flying Corps. He obtained his pilot's certificate last March, and at the time of his death was acting as an instructor with a Training Squadron. He and his mechanic lost their lives while bringing back to their station a machine which had been forced to land in another part of the county.

The tributes received from those among whom he worked, fought, and died bear witness to his modest, serene, and kindly nature, and to his high ideals of duty and of a soldier's calling.

TREADWELL.—Lieut. R. Naylor Treadwell, M.C., Essex Regt., attd R.F.C., who died on Sept. 9th at a casualty clearing station, of wounds received in action on August 11th, was the only surviving son of Mr. O. F. N. Treadwell and Mrs. Treadwell, 90, St. George's Square, S.W.1, and brother of Mrs. G. H. Walford, Kohat, Camberley.

WILKINSON.—Sec. Lt. Harold Reid Wilkinson, R.F.C., who died on Sept. 10th, at Queen Alexandra's Hospital, of wounds received in action on May 10th, 1917, was the son of the Rev. F. Wilkinson and Mrs. Wilkinson, of Toronto, Canada. He was 24 years of age.

Engagements.

COWIE—DUTTSON.—An engagement is announced between Lt. J. Douglas Cowie, Argyll and Sutherland Highlanders and R.F.C., only son of Mr. and Mrs. J. W. Cowie, Heathside, Putney, and Phyllis May, only daughter of Mr. Stanley W. Duttson, 19, Bramham Gardens, South Kensington, S.W.

HILL-MORTON.—A marriage has been arranged, and will shortly take place at Houghton, Stockbridge, Hants, between Major Roderic Hill, M.C., R.F.C., elder son of Professor and Mrs. M. J. M. Hill, and Helen, elder daughter of Lt.-Col. E. R. Morton, Indian Army (retired), and Mrs. Morton (*née* Edwards, of Mess Strange, Shropshire).

SEAL—HILL.—The marriage arranged between Lieut. J. Darell Seal, Essex Regiment, attd R.F.C., eldest son of Mr. and Mrs. Arthur H. Seal, of Richmond, Surrey, and Phyllis, elder daughter of the late Mr. J. A. Hill, of Antwicks Manor, Wantage, Berks, and Mrs. A. W. Pratt, of Highbury, Wantage, will take place at St. Peter's Church, Wantage, at 12 on Thursday, October 11th (leave permitting). Owing to the war, there will be no invitations or reception.

THORNE—THURSBY.—The marriage of Lieut. Arthur B. Thorne, R.F.A., attached R.F.C., of Heacham, Norfolk, and Katharine Gwenllian Thursby, of Castle Rising, Norfolk, will take place very shortly at Castle Rising.

Marriages.

BOUMPHREY—GRANDAGE.—On Sept. 6th, at Holy Trinity Church, Sloane Street, S.W., Capt. Geoffrey Maxwell Boumphrey, R.F.C., fifth son of the late Arthur B. Boumphrey and Mrs. Boumphrey, Baycliffe, Lymm, Cheshire, was married to Esther Mary, second daughter of Mr. and Mrs. George Grandage, Byron House, Harrow-on-the-Hill, by the Rev. H. T Robinson, uncle of the bride.

ENGLAND—STANES.—On August 28th, at the Parish Church, Broadstairs, Lieut. Norman Herbert England, R.F.C. (of Sarawak Civil Service), son of Major F. H. England, late Royal Welch Fusiliers, was married to Dorothy Caroline, daughter of the late H. T. Stanes, Esq., Nilgiris, India, and Mrs. Stanes, of Monckton Combe.

LINE—DIMMOCK.—On Sept. 8th, at St. Mary's Church, Wimbledon, Capt. James Line, R.F.C., was married to Dorothy Beatrice Gertrude, second daughter of Lt.-Col. (I.M.S.) and Mrs. H. P. Dimmock, 23, Homefield Road, Wimbledon.

ROWDEN—JOBSON.—The wedding of Capt. C. R. Rowden, M.C., Worcestershire Regt. and R.F.C., son of Mr. Roger Rowden, and Miss Frances Jobson, daughter of Mrs. Howard C. Jobson, of Mill Croft, Rottingdean, Sussex, took place on Sept. 12th at St. Andrew's Church, Ashley Place. Canon Edgar Sheppard, Sub-Dean of the Chapels Royal and Sub-Almoner to the King, performed the rite, and was assisted in the service, which was fully choral, by the Rev. W. A. Pearman, uncle of the bridegroom.

TODD—HARDWICK.—On Sept. 13th, at St. Paul's Church, Lincoln, Lieut. A. W. Todd, East Yorks Regt. and R.F.C., younger son of the late W. A. Todd, Esq., and Mrs. W. A. Todd, Newland Park, Hull, was married to Queenie Hardwick, only daughter of Engr. Capt., R.N., and Mrs. Hardwick, of 24, Avonmore Road, W. Kensington, by the Rev. John Kaye.

Births.

ALLAN.—On Sept. 11th at Osterley Nursing Home, Isleworth, the wife of Sec. Lt. W. Allan, R.F.C., of a son.

READ.—On Thursday, Sept. 6th, to the wife of Lieut. J. V. Read, R.F.C., 3, Old Coastguards, Charmouth, Dorset, a son.

WOOD.—On Sept. 12th, at "Hele House," Ashburton, Devonshire, to Mildred (née Uniacke), wife of Capt. W. T. Wood, R.F.C.—a daughter.

The following names are from the official list of officers who were lately prisoners in Germany and have been repatriated:—

Brown, Lt. A. W., 3rd Manch. R., attd. R.F.C.
Firstbrook, Lt. J. H., R.F.C.
Frost, Sec. Lt. H. G., 9th Suffolk Regt., attd. R.F.C.
Macaskie, Sec. Lt. D. S. C., R.F.C.
Macfie, Sec. Lt. J. D. A., 9th B. Watch, attd. R.F.C.

* * *

Sec. Lt. Gilbert S. M. Insall, V.C., R.F.C., who was captured by the Germans in January, 1916, has arrived in England, having escaped from Germany.

He won the V.C. in November, 1915, for a daring feat. In a Vickers fighting machine he pursued and attacked a German machine near Achiet. With great skill he manœuvred to close range, and brought the German machine down four miles south of Arras.

* * *

The parents and sister of Sec. Lt. G. A. H. Parkes, R.F.C., of Upper Staplehall, Northfield, Birmingham, reported missing on July 15th, have heard from him that he is wounded in the left arm and a prisoner of war in Germany. He is receiving treatment at a special hospital for arm cases, Reserve Lazarett, 3, Johannisthal, Stettin, Deutschland.

* * *

News of Lt. A. J. C. E. Phillipps, R.F.C., whose machine fell near Hollebeke German Lines, June 7th, will be gratefully received by his mother.—All letters should be addressed to Box E.930, "The Times."

* * *

A Reuter report from the British Army Headquarters in France on Sept. 16th, says:—

A British county battalion was marching through the main thoroughfare of a certain town in Northern France at the time that a German air raid was in progress. The band continued to play without faltering, and the only departure from strict march discipline which the men committed was to punctuate the crash of each bomb with a round of hilarious cheering. Not a man fell out.

* * *

It is announced that in future commissions for the post of equipment officers in the R.F.C. will not be granted until the candidate has completed a course of training as a cadet.

* * *

On September 11th an aeroplane, with two occupants, nose-dived into Fleet Pond, near Farnborough. Mrs. Mitcham, wife of a sergeant in the Dragoon Guards on active service, swam out 400 yards to the assistance of the aviators, but found that they had escaped in safety.

FRANCE.

Official Communiqués.

Sept. 11th.—Last night German aeroplanes bombarded the region of Dunkirk. Bombs fell on a hospital and about 15 women were wounded.

On Sept. 10th three German aeroplanes were brought down in a fight with our pilots. A fourth enemy machine was destroyed by the fire of our anti-aircraft guns.

Army of the Orient.—On the rest of the front there have been the usual artillery actions. British aeroplanes bombarded successfully enemy camps in the region of Rupel (Struma front).

SEPT. 12th.—Enemy aeroplanes bombed the region of Dunkirk.—There were several victims among the civil population.

During the day yesterday four German aeroplanes were brought down by our pilots, and 10 other enemy machines fell in their own lines badly damaged.

Our bombarding aeroplanes dropped numerous projectiles on the stations of Roulers, Cortemarck, and Staden, the aviation ground at Colmar, the stations of Conflans and Ferny, and some military works to the south-east of Saarburg.

SEPT. 13th.—Last night German aeroplanes dropped bombs in the region of Dunkirk. Our aviators successfully dropped bombs at Hoglet, Cortemarck, Gits, Geite, Lindenken, Staden, and on the aviation grounds north-east of Thourout.

SEPT. 15th.—During the days of the 13th and 14th four German aeroplanes were brought down in aerial fighting.

SEPT. 17th.—In the course of yesterday four German aeroplanes and a kite balloon were brought down by our pilots, and a sixth hostile machine was brought down by our anti-aircraft guns. In addition, six other German aeroplanes were seriously damaged as the result of combats with our aviators and fell within their own lines.

Our bombarding squadrons showed themselves particularly active during yesterday and last night. Many raids were carried out by our machines, which dropped 15,000 kilogrammes (about 15 tons) of bombs on enemy establishments, including the barracks and munition factories at Stuttgart (136 miles east of Nancy), the aerodrome at Colmar (66 miles south-east of Nancy), the store buildings at Logelbach, the military establishments south of Metz, the railway station at Thionville (50 miles north of Nancy), the munition factories at Uckingen (north of Metz), and the railway station of Saarburg (40 miles east of Nancy), etc.

* * *

DONZE—PENNY.—A marriage has been arranged, and will shortly be celebrated, between Brigadier-Pilote Robert Louis Donzé, Escadrille N.93, French Aviation Corps, youngest son of Mr. and Mrs. Eugène Donzé, of Santa Barbara, California, U.S.A., and Gladys Isabel Mackenzie Penny, only daughter of the late Don Mariano and of the late Mrs. Mackenzie Penny, of Aberdeenshire, Scotland.

GERMANY.

OFFICIAL COMMUNIQUÉS.

SEPT. 11th.—Yesterday Lieut. Voss shot down three enemy aviators. He has thereby increased the number of his aerial victims to 45.

SEPT. 12th.—Nineteen enemy aviators have been brought down. One of them was brought down by Lt. Voss (46th aerial victory).

SEPT. 13th.—Lieut. Voss shot down his 47th adversary in aerial battle.

SEPT. 15th.—Lieut. von Bülow brought down his 20th adversary in aerial battle.

SEPT. 17th.—Two aeroplanes were shot down by one of our pursuing squadrons out of enemy aerial squadrons which bombarded Colmar (40 miles south-south-west of Strassburg) twice yesterday (Monday). In addition to this the enemy lost 16 aeroplanes.

Ober Lieut. Berthold brought down two enemy aviators in aerial combat on Sept. 15th, and Ober Lieut. Schleich has brought down three opponents in aerial battle during the last two days.

* * *

A report from Amsterdam, dated Sept. 13th, states that Lieut. Hohendorf, one of Germany's best fliers, was shot down by British aviators in France last week. He was a celebrated pilot in peace time.

The career of Lieut. Hohendorf, as far as the German official reports record it, closed apparently at the end of July, 1916. He was then credited with having brought down his eleventh aeroplane. It may be surmised that he had been temporarily put out of action by a French or British aviator until his reappearance last week.

He was, at any rate, a man of large enterprise. It is related by the "Guerre Aérienne" that in 1913 Hohendorf presented himself as a pupil at a flying school in France, stating that he was from Switzerland. He made remarkable progress as a flier, and apparently more as a spy. He was discovered by two workmen in the act of taking accurate measurements of the internal parts of a machine and recording them in a notebook. When asked to give an account of his actions, he denied everything. The notebook was taken from his pocket, and confronted with that evidence of espionage he stood confounded. Unfortunately, while the workmen were communicating with the authorities, Hohendorf found an opportunity to escape and disappeared.

Lieut. Hohendorf received the Order Pour le Mérite in July, 1916.

RUSSIA.

OFFICIAL COMMUNIQUÉS.

SEPT. 11th.—A squadron of our aeroplanes, consisting of five machines, bombarded enemy depots and hutments in the region of Doubrowa, to the south-east of Kovel. Ten poods of bombs were dropped. In the same region the airship (?) Ilia Mourametz dropped bombs on enemy convoys and batteries.

On the Rumanian front four aerial combats took place on Sept. 9th as a result of which four enemy aeroplanes were forced to descend in their own lines.

Enemy aeroplanes dropped bombs on the stations of Zamirie (Minsk-Baranovitchi sector) and Radziviloff (near the Galician frontier).

SEPT. 13th.—In aerial engagements in the region of Husiatyn and Skala our aviators forced two enemy machines to descend precipitately. Our aeroplanes dropped bombs on various enemy positions. Five poods (about 180 lb.) of bombs were dropped on the small town of Krivoshin (to the south of Baranowitschi), while eight poods (about 290 lb.) were dropped in the Kovel region.

SEPT. 15th.—On September 13th a series of aerial engagements took place, Capt. Kazakoff brought down his 17th enemy aeroplane in the region of Husiatyn. The enemy aviators were taken prisoners.

AUSTRIA.

OFFICIAL COMMUNIQUÉ.

SEPT. 13th.—Aviators bombed Jojani, killing several inhabitants.

ITALY.

OFFICIAL COMMUNIQUÉS.

SEPT. 13th.—An enemy aeroplane brought down by our anti-aircraft fire fell in the neighbourhood of Duino (Gulf of Trieste).

SEPT. 15th.—On the Carso the enemy's lines of communication were bombarded by our aviators with about three tons of bombs.

During an aerial combat an enemy aeroplane was brought down in flames and fell in the Auzza Torrent (Avscek). The pilots were killed.

SEPT. 16th.—Troops massed in the Ravnica area (east of Mt. S. Gabriele) were bombarded with about two and a half tons of bombs by two of our air squadrons.

* * *

A report from Washington states that Capt. Riznati, of the Italian Army, made a flight lasting six hours over Virginia on September 13th. He used a Caproni machine and carried six passengers. The flight was successfully accomplished in the teeth of a gale.

* * *

It is reported that on September 6th, behind San Gabriele, Capt. Baracca had his nineteenth victory, and on the 14th Comdr. Piccio brought down in flames his eleventh enemy machine.

TURKEY.

OFFICIAL COMMUNIQUÉS.

SEPT. 10th.—SINAI FRONT.—The aerial activity of the enemy has decreased on this front.

Our seaplanes successfully dropped bombs on the enemy hangars at Mudros. In spite of violent artillery fire our machines returned safely.

SEPT. 12th.—On the Sinai front an enemy aviator was forced by our artillery fire to land behind his own lines.

SEPT. 14th.—Hostile aeroplanes attacked Smyrna, two persons being wounded and four private houses and shops destroyed.

BELGIUM.

OFFICIAL COMMUNIQUÉS.

SEPT. 11th.—Our aviators have made 75 flights during the past two days, have taken numerous photographs, and directed the fire of our guns, and have engaged in several fights. Further, an enemy machine was shot down this morning within our lines, and a second machine was brought down within the enemy's lines in the direction of Schoorbakke.

SEPT. 13th.—During the night of Sept. 12th-13th several of our cantonments were bombed by enemy aviators.

* * *

A Belgian official telegram received from Havre on Sept. 14th narrates an incident on the Belgian front some time ago which illustrates in a striking fashion the close solidarity and the friendly feelings existing among the soldiers of the Allied Armies. One afternoon the Belgian soldiers witnessed from the trenches along the Nieuport-Dixmude railway an aerial fight during which a British aeroplane, surrounded by five Germans, was brought down in No Man's Land. It fell about 150 yards from the Belgian and German lines east of Ramscapelle, and the enemy opened fire on it as soon as it reached the ground.

With the hope of bringing help to their Allies, a few Belgian soldiers, led by Sergeant Bernimolin, volunteered to leave their trenches under a very violent fire. Crawling in the mud, they succeeded in reaching the machine, only to find the British aviators already dead, and brought back the body of one of them.

Some hours later, as soon as the enemy's fire relaxed, the Belgians went back to the machine and found a party of Germans engaged in despoiling the corpse of the second aviator. They put the enemy to flight, and, in spite of a violent fire directed against them by the Germans, who were furious at being deprived of their loot, carried the second body back to their lines. A few hours later a third party went back in order to set fire to the wrecked machine, so that no fragment of it should fall into German hands.

HOLLAND.

A message from Ymuiden, of recent date, gives some details regarding a Zeppelin attack on Sept. 10th on the Swedish steamer, "Flandria," supplied by passengers, who state that the first bomb which was dropped narrowly missed the ship. The engines were stopped. Four more bombs were, however, dropped dangerously near the vessel. Before all those on board had entered the boats, there was a panic, and the captain had to use his revolver several times. The ship's company, after remaining for a couple of hours in the boats, returned to the "Flandria." At six o'clock in the evening another airship appeared and hovered above the ship for a time, but departed without doing harm.

DENMARK.

A message from Copenhagen, dated Sept. 16th, states that a German aeroplane, marked "No. 6," left Hamburg on September 4th for Warnemünde (Germany). It has now been found in a damaged condition in the Baltic, not far from the Danish port of Langeland. The aviators were missing.

INDIA.

From the "Daily Express" of Sept. 13th :—

"Bengal and Sind are engaged in a friendly rivalry just now in the organisation of flying corps. The Bengalis are purchasing 12 aeroplanes and enrolling pilots, observers, and mechanics, while the Karachi scheme includes a large aerodrome, flying school, and workshops as the nucleus of an Indian aerial base."

[Seeing that there are no native artillery batteries, it seems somewhat peculiar that there should be native pilots and observers.—Ed.]

THE DEVELOPMENT OF AIR WAR.

A special correspondent of the "Morning Post" writing from the British Front of the raids made by the British upon the German trenches, on Sept. 17th, says :—

Meanwhile large numbers of aeroplanes were raiding and bombing various aerodromes' depots behind the German lines, in the daylight as well as the darkness, and attacking the troops with machine-guns. Yesterday morning some of our airmen sighted some two thousand German infantry marching on the Menin-Mouscron road, with the tail of the column just leaving Mouscron. Our aeroplanes dropped to 200ft. and dispersed the troops in confusion, with many casualties.

Our airmen have been very active, despite the unfavourable weather. A thick mist and high winds have been responsible for many comparatively blank days, but even the worst conditions for flying have not caused an absolute suspension of the bombing raids and air fighting. Enemy bases are pounded continually and accurately. Hardly a night passes without great fleets of bombing machines passing safely above the German lines in Flanders and Northern France and unloading tons of explosives many miles behind them. The effect of these successful raids is to keep certain German aerodromes in a state of semi-destruction and to wear down the nerves of their staffs by not giving them an opportunity to repair the damage done by one raid before another is made.

[One hopes that particular attention is being paid to the aerodromes in Flanders whence the raids on England start, and where the raiding machines are assembled.—Ed.]

Our bombers are more accurate than ever. Direct hits on aeroplane sheds are of nightly occurrence, and others are made on railway stations, rolling stock, munition factories, balloon winches, land searchlights, torpedo-boats, waggon transport, and ammunition dumps. The German airmen invariably follow British policy. They never dared to attack infantry with machine-guns until our men had broken many of their columns on the march and relief detachments on the battlefield, and cleared trenches of their occupants by diving so close that their wings nearly brushed the parapet. They did not attempt daylight bombing until the success of many such British raids forced the German Air Department to insist on similar tactics by their fliers. We were the first to make long-distance raids on a large scale, the first to subject hostile aerodromes to continued bombing night after night, and the first to adopt large formations for reconnaissance.

[But is it a fact that the Germans now carry on their bombing raids on a bigger scale owing to their having more machines? —Ed.]

Much has been heard of the Gotha Type of German aeroplane. For the moment it appears to occupy the same position in the public mind as did the so-called "Taubes" at the beginning of the war and the over-advertised Fokker some months later. The Gotha, which is devoted to bombing, is easily outclassed by British machines engaged in the same work. Larger and more powerful raiders than the Gotha are working in the enemy's back areas every night.

[Quite so, but do we use as many of them as the Germans do?—Ed.].

LORD NORTHCLIFFE AND THE AMERICAN AIRCRAFT INDUSTRY.

The following is from an article by Lord Northcliffe, published in the Philadelphia "Public Ledger" of Sept. 18th :—

The enthusiastic outpourings of air amateurs and their cries of "One hundred thousand aeroplanes" have made a good many people sceptical as to American participation in the air fighting. But behind all that talk is already a vast accomplishment. The solid foundation has been laid of an air service backed by practically illimitable man-power and machine-power. Its fruits will be shown as suddenly as came conscription. The movement is going on as rapidly as possible having regard to the thoroughness with which everything is being done. There has been a complete *liaison* with the air services of France and England. The models of the latest French and English machines are here. While no time has been lost, most careful consideration has been given to a definite plan of campaign.

I wish I could say as much with regard to the speed of American shipbuilding. I have already expressed my opinion, which is shared by many people here, that so long as the Allied Governments hide the truth as to the real nature of the submarine danger the burning enthusiasm which Americans are putting into their air service will be lacking in the American shipyards.

This, however, is the only direction, so far as I have been able to judge, in which more might be done than is being done at present.

AVIATORS AND THE LAW.

Sqdn. Comdr. F. E. T. Hewlett, R.N., of the Air Board Office, was fined 35s. on Sept. 13th at West London Police Court for exceeding the speed limit with a motor-car. His licence was ordered to be endorsed. The case had been adjourned from the week before for the production of the licence, Comdr. Hewlett writing that he was too busy to attend the Court.

Among the motorists dealt with at Kingston on Sept. 13th for exceeding the speed limit was Capt. Stanley Graham Gilmour, R.F.C., who was fined £10, his pace on the Portsmouth Road at Thames Ditton being given by the police as over 33 miles an hour on a Sunday afternoon.

A similar fine for a like offence was imposed on Francis Gilmour Tempest Dawson, of the Summer House, Hamble, against whom seven previous convictions were proved. His pace at Kingston Vale on a Sunday evening was given as over 28 miles an hour.

[It would seem that the police, instructed by the prejudiced old fossils who maladministrate the laws of the land, are making a dead set against the few motorists left on the road, irrespective of whether they are driving on the nation's business or not. The idea of an officer and an ex-officer being fined £10 for a paltry 33 and 28 miles an hour on a free and open road probably appeals to a crowd of shop keepers who do nothing to help in the war, and the action provides an excellent example of what we may expect under a democratic government.—Ed.]

A SERIOUS CASE.

At Southwark on Sept 13th, Mr. Walter Schroder held an inquest on the body of Nellie Wheeler, aged seven, daughter of a driver in the Transport Service, of Empress Street, Walworth Road, who was killed on Sunday afternoon by a motor lorry alleged to have been driven by 1st Air Mechanic H. Robinson, who has been remanded on a charge of manslaughter.

Lieut. Beresford, R.F.C., said that, in view of the serious position of the driver, he would watch the proceedings on his behalf.

Nellie Wheeler, mother of the child, said that at 4 o'clock on Sunday afternoon she was standing at her street door when she saw a motor-lorry come round the corner at great speed. The lorry mounted the kerb on the opposite side of the road and came across the street, mounted the pavement, and dashed into the witness's house. It pinned three adults and two children against the wall. The witness ran away, but hearing screams, returned to the door and saw her daughter lying dead.

Joseph Roddis, the child's grandfather, declared that the motor came round the corner at 16 or 17 miles an hour, "like lightning." The witness told the driver that he ought to be ashamed of himself for coming round the corner as he did, and the driver replied, "Make it as light as you can for me."

Lieut. Beresford was putting some questions when the witness exclaimed, "I say it was a joy ride. The lorry had been round the houses three or four times, once with children in it." He admitted that the driver was "a bit shaky and upset" after the accident. The inquiry was adjourned.

WHAT, WHO, WHERE, AND WHY?

From the "Daily Mail" of Sept. 18th :—

A number of valuable plans of aeroplanes, which mysteriously disappeared a few days ago, were recovered in London yesterday in a remarkable manner.

The plans were stolen from the offices of H. Alexander and Co., aeroplane manufacturers, Charing Cross Road, and as they were of considerable importance New Scotland Yard detectives were

informed of the loss. They made careful inquiries in many directions but nothing resulted until yesterday, when Divisional Detective-Inspector Mercer and Sergeant Miles went to the cloakroom of Piccadilly Circus Tube Station, where, after a prolonged search, they found an unaddressed parcel fastened with green seals. On opening the parcel the detectives found the plans.

Later the detectives arrested a Greek named Faedo Cokinaki, whom they met in Elgin Avenue, Maida Vale, and conveyed to Bow Street Police Station, where he was charged.

[Alexander the Great (Conqueror) we know, Alexander the Great (Tailor) we know, but who is Alexander the great aeroplane designer? It is interesting that plans of such importance should be produced by a firm unknown to the majority of people in the Aircraft Industry.—Ed.]

TYPES OF BRITISH AIRCRAFT.

Brown, Bros., Ltd., of Great Eastern Street, London, E.C., have issued an interesting souvenir in the shape of a portfolio of pictures of "Types of British Aircraft," which consists of sixteen plate-sunk sketches on art paper, by Mr. Geoffrey Watson, illustrating well-known modern British aeroplanes.

Readers of The Aeroplane, who would like to have a free copy of the portfolio, are invited to send two stamps to Brown Bros., Ltd., for postage.

R.F.C. CRICKET.

From the "Morning Post":—

Unable to place a representative side in the field at Mitcham on Sept. 12th, the Public Schools lost by 56 runs to the Royal Flying Corps (Farnborough), who have gone through the season unbeaten. Still, the boys, whose eleven included only two regular bowlers—Stevens, of U.C.S., and Calder, of Cranleigh—made a creditable fight against their formidable opponents, of whom five were first-class county players. Bowling unchanged, Stevens took six wickets for 59 runs and Calder four for 40. The fielding was excellent, and Cuthbertson, Williams, and Hilder all brought off brilliant catches. For the R.F.C., Makepeace (Lancashire) batted skilfully for more than an hour, failing to a catch of exceptional merit. Horsley (Derbyshire) obtained five wickets for 12 runs and Harrison (Sussex) three wickets for 11 runs.

Public Schools.

M. R. Jardine (Winchester), 1 b w, b Horsley	11
A. L. Hilder (Lancing), b Waddington	2
G. T. S. Stevens (U.C.S.), c Harrison, b Horsley	10
H. R. Williams (Charterhouse), b Horsley	0
G. C. Cuthbertson (Malvern), c Evans, b Harrison	19
H. L. Calder (Cranleigh), b Horsley	0
A. W. F. Hobson (Westminster), b Harrison	1
C. E. Abelson (St. Paul's), c Horsley, b Harrison	0
H. E. G. Rayment (Cranleigh), run out	1
R. C. Brooks (Haileybury), c Smith, b Horsley	2
Howard Lacy, not out	0
Extras	5
Total	51

R.F.C. (Farnborough.)

Corporal Makepeace, c Cuthbertson, b Calder	33
Corporal Allen, c Williams, b Stevens	2
Air Mech. Harrison, b Stevens	0
Air Mech. Taylor, b Stevens	3
Air Mech. Waddington, b Stevens	13
Air Mech. Horsley, 1 b w, b Stevens	14
Flight Sgt. Charteris, c Cuthbertson, b Calder	11
Air Mech. Evans, b Calder	9
Air Mech. Smith, c Hilder, b Stevens	1
Lieut. Harrow Bunn, b Calder	10
Capt. V. C. Hollender, not out	3
Extras	8
Total	107

AN ANNUAL OUTING.

The employees of the aero department of Thompson Bros. (Bilston), Ltd., held their annual outing on Saturday last, the 15th inst., journeying in chars-a-bancs to the ancient village of Tong, Shropshire, some 15 miles distant, which is noted for its Castle and Church, the latter dating from the year 1100. After viewing the sights, tea was taken at the Bell Inn, at the conclusion of which Mr. H. J. Thompson spoke a few words of the progress of this department and of the good feelings which exist between the workers and the firm. Mr. Meredith (Works Manager) also spoke thanking the workers for their assistance in helping to attain the present state of efficiency.

THE SOPWITH WORKS SPORTS.

On Saturday, Sept. 15th, the Sopwith Aviation Co., Ltd., held their annual sports on the Old Kingstonian's football ground, all the takings being handed over to the Flying Services' Fund. An extremely good entry was obtained, and a large crowd collected to view the sports, the number of persons being variously estimated at 3,000 and 5,000. The programme was very lengthy, and, unfortunately, several events had to be postponed, but those which took place were very satisfactory, the results being as follows:—

100 yds. Works' Championship (ladies)—Miss Cremer 1, Miss Moatt 2, Miss L. Hooper 3.

350 yds. Scratch Race (boys)—W. Arnold 1, E. Murray 2, A. Little 3; 2 yds., yd.; 51 2/5 sec.

Apple Bobbing—F. Gough 1, F. Roach 2, A. Little 3.

440 yds. Works' Championship, for the "Aeroplane" Cup.—A. Whitehorn 1, W. Brider 2, F. Driver 3; 3 yds., yd.; 56 1/5 sec.

Tug-of-War (munition workers)—Sopwith beat Napier by 2 pulls to 0.

100 yds. Handicap (munition workers)—H. A. Baker, R.A.F., 10½ yds., 1; J. M. Hicks, Finchley, H., 7½, 2; W. Pendlebury, R.A.F., 8, 3; 2 yds., ½ yd.; 10 sec.

100 yds. Invitation Handicap—H. R. Wicks, R.N.A.S., 4 yds., 1; Sgt.-Maj. Mawby, R.F.C., scr., 2; Air Mech. P. G. N. Baker, R.F.C., 4, 3; 1½ yds., 2½; 10 1/5 sec.

Mile Works' Walking Championship—A. W. Marder 1, E. Pettman 2, S. Spriggs 3; 90 yds., 70 yds.; 8 min. 55 sec.

100 yds. (boys)—W. Arnold 1, A. Gough 2, O. Pizzy 3; yd., yd.

100 yds. (veterans)—L. T. Smith, 4 yds., 1; T. Weller, 16, 2; J. Rimmer, 8, 3; yd., ft.

Wrestling Match (catch-as-catch-can)—F. W. Knight (amateur bantam champion, 1908 and 1911) beat G. Appleton, Sopwith A.C., by 2 falls to 1.

Mile Works' Championship—A. Bale 1, J. W. Wilson 2, A. C. Mayell 3; 30 yds., 5 yds.; 5 min. 10½ sec.

100 yds. Works' Championship—V. W. Derrington, J. Whitehorn, J. Grant 3; 10 4/5 sec.

440 yds. Handicap (munition workers)—M. J. Kehoe, Arc Works A.C., 24 yds., 1; F. R. Manton, Beck United A.C., 26, 2; G. P. Sweet, Surrey A.C., 14, 3; 4½ yds., 1½ yds.; 50 sec.

Mile Open Relay Race (880, 440, 220, and 220 yds.)—Vickers, Crayford, A.C. (P. Hodge, H. Smith, H. Hutchinson, F. Badcock), 1; Vickers, Erith (O. C. Currall, G. Henstridge, W. Kemp, A. Ashfield), 2; Napier's, 3; 5 yds., 7 yds.; 3 min. 58 2/5 sec.

Mile Open Handicap—A. H. Nichols, S.A.C., scr., 1; F. Maxim, Finchley H., 118 yds., 2; J. H. Hook, Finchley H., 175, 3; ins., 5 yds.; 4 min. 29 4/5 sec.

Music was supplied by the Sopwith Orchestra and dancing was indulged in at the conclusion of the sports, several hundreds of persons taking part. The success of the function is a tribute to the efficiency of those who took part in its organisation, and one looks forward to a still larger entry for the next annual sports of this pioneer firm.

TRADE CARDS.

MISCELLANEOUS ADVERTISEMENTS.

TUITION.

THE POLYTECHNIC, 309, REGENT ST., LONDON, W.1.

The Special Evening Courses in
AERO-ENGINEERING
will commence on October 1st, 1917.

The Course comprises (i) Science of Flight, (ii) Aircraft Design, (iii) Aero-motors, (iv) Engineering Drawing, etc.
Full Syllabus can be obtained on application to Major Robert Mitchell, Director of Education.

A course of about twenty lectures, suitable for young engineers will be given by Mr. Campbell Houston, B.Sc., A.M.Inst.C.E., at the South-Western Polytechnic Institute, Manresa Road, Chelsea, on Tuesday evenings at 8 o'clock, commencing October 9th. Fee 10s. Engineering departments open for session on September 24th. Syllabus from Secretary (Room 45).

MODELS.

Model Motors.—First-class ½-h.p. Motors, air or water-cooled, castings, with cylinder-bored valves bored, crank-cases spigotted, sparking-plug tapped, valve box machined out; instructive; cheap, 9s. 9d. Catalogue — Gas, Oil, Petrol Motors — 2d. — Littleover Motors, Derby.

T. W. K. Clarke and Co., Ltd., Model Department, Hampton Wick.—Though we are full up with full-size aeroplane parts orders, we still build models as we did in 1906. Sopwith Biplanes, etc., in Stock.—Send 3 stamps for our illustrated list, 120 items and 14 models; certain aluminium goods are out of stock.

FOR SALE.

60-80-h.p. Aerial six-cylinder chassis, H.T. magneto, four speeds and reverse, artillery wheels, very fast, powerful car, £200.—Palmer's Garage, Tooting, S.W.

Tarpaulins for Sale.—Good second-hand railway truck sheets repaired and redressed, London Works.—Write for prices, Johnston, 12 Broughton Road, Croydon.

Aeroplane Radiators.—The Gallay Radiator Company, Limited, stock Aeroplane Radiators. For the benefit of Constructors, can supply radiators for experimental purposes at a nominal cost. Advice given on suitable types for the various approved engines. Our drawing office is always at our clients' disposal.—198, Great Portland Street, London, W.1.

For Sale, spares for 80-h.p. Gnôme engine; in excellent condition.—Apply Box No. 2093, THE AEROPLANE, 166, Piccadilly, W.1.

Caudron-type Biplane for Sale, make excellent rolling bus; also 35-h.p. Anzani and quantity of Blériot spares.—Box No. 2080, THE AEROPLANE, 166, Piccadilly, W.1.

WANTED.

Metal Work, welding, etc., wanted by firm with up-to-date plant; skilled staff; prompt and personal attention.—Shephard, 528, Kingsland Road, E.8. Phone, Dalston 3404.

Wanted Sheet Metal Work in copper, brass and turned steel tanks and tubing.—Apply F. W. Hall, East Anglian Copper and Brass Works, Norwich.

Aero-engine Parts.—Wanted firms with capstan and turret lathes to undertake large quantities of parts for aero-engines.—Apply Rolls-Royce, Ltd., Derby.

AIRCRAFT PARTS.

Hardwood for Aeroplanes.—Specially Selected air-dried timber as supplied to leading constructors in Britain and the Continent. Silver Spruce, Ash, Poplar; Hickory and Ash Skids; Threeply; Thin Cedar and Mahogany for Floats; Walnut for Propellers.—William Mallinson and Sons, Ltd., Hackney Road, 'Phone, 3854 Central, 4770 Wall.

Tapes, Webs, Cords and Threads in all qualities, suitable for Aircraft Work. Delivery from stock.—John MacLennan and Co., 30, Newgate Street, London, E.C.1. (See Advertisement Page 845 and Buyers' Guide.)

Aeroplane Seats. We can give quick delivery of cane seats, A.G.S. 264 or other patterns, guaranteed pass inspection. Write us for anything required in cane work.—The Willowbrook Company, Leicester.

ENGINEERING.

British School of Aeronautics. — Aircraft Engineering Course; Aero Design; Aero Construction; Aero Draughtsmanship; Mechanical Engineering. — Pennington's, 254, Oxford Road, Manchester.

PUBLICATIONS.

"MONO" INSTRUCTION BOOK No. 1 issued by the Gnôme and Le Rhône Engine Co. New Edition. The Wm. Dawson Publishing Co., Ltd., 2, Breams Buildings, E.C. Price 4s. 6d. net. Post free, 5s.

Small Factory Output and How to Speed It. By G. H. Mansfield. Price 1s. 3d. net. Post free, 1s. 6d. The William Dawson Publishing Co., Ltd., 2, Breams Buildings, E.C.

All Advertisements for the Miscellaneous Advertisement Columns MUST arrive at this office by first post on Saturday.

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FINANCE.

Practical Aeroplane Manufacturer and Engineer, with many years' experience of aircraft design and construction, would like to meet Capitalist, Syndicate, or private gentlemen interested in military aviation or commercial aeronautics. Excellent proposition to put forward.—Apply Box No. 2050, THE AEROPLANE, 166, Piccadilly, W.1.

SITUATIONS VACANT.

Splicer required for steel cables (aeroplane erection). First-class workman essential. No one already engaged on Government work or resident more than 10 miles away will be engaged.—Apply personally or by letter to Works Manager, Handley Page, Ltd., Kingsbury Works, Edgware Road, Hendon, N.W.

Wanted—good man to assist works manager and buyer in aeroplane works, must be experienced in all branches. No one already engaged upon Government work or residing more than 10 miles away need apply.—Reply by letter to F. W. Berwick and Co., Ltd., Cumberland Avenue, Park Royal, N.W.10.

Wanted an Experienced Storekeeper for aeroplane works near London. Good salary and prospects to the right man. Must be ineligible. No one residing more than 10 miles away or at present employed on Government work need apply.—Box No. 2079, THE AEROPLANE, 166, Piccadilly, W.1.

Wanted Storekeeper—Assistant Buyer, experienced for aeroplane works. No one residing more than 10 miles away or engaged on Government work need apply. Write stating experience and salary required. — Offer, Church Street, Kingston-on-Thames.

Wanted an Experienced Cost Clerk for large aeroplane works near London. Good salary and prospects to the right man. Must be ineligible. No one residing more than 10 miles away or at present engaged on Government work need apply.—Box No. 2078, THE AEROPLANE, 166, Piccadilly, W.1.

Aeroplane Fitters wanted for assembling main planes and similar work; near London. Good wages to suitable men. No one residing more than 10 miles away or engaged on Government work need apply. Write stating age, experience, and wages required to Box 189, c/o Mitchell's Advertising Agency, 1, Snow Hill, E.C.1.

Aerodrome Engineer.—Experienced engineer wanted, capable of taking charge of aeroplanes and their engines from completion of erection until final acceptance. Must be tactful, steady, and willing to attend at all hours. N.W. District. No one resident more than 10 miles away or engaged on Government work need write 438, Sells, Ltd., Fleet St., E.C.4.

Tool maker required immediately, used to jigs and turret tools. No one residing more than 10 miles away or already engaged on Government work need apply. State experience and wages required.—Caffyn's, Ltd., Eastbourne.

Experienced Foreman required for aircraft woodwork, capable of superintending all branches. No one residing more than 10 miles away or engaged on Government work need apply. State experience and salary required.—Caffyn's, Ltd., Eastbourne.

SITUATIONS WANTED.

Gentleman recently discharged from Army and with seven years' experience of aircraft design and construction, desires responsible position on staff of established aeroplane firm, preferably as department manager, buyer, or outside representative. Good organiser and correspondent.—Apply Box No. 2049, THE AEROPLANE, 166, Piccadilly, W.1.

To Munition and Aeroplane Manufacturers.—Works architect for large war factories recently erected in the Midlands, open to immediate engagement. Complete familiarity with all requirements for shell and aero-works. Excellent credentials. A man with ideas and initiative and not afraid of work.—Communicate with Box No. 2063, THE AEROPLANE, 166, Piccadilly, W.1.

Aero-engine Manufacturer (assistant or works manager) capable of supervising entire plant, including estimating, ordering, drawing office, plant planning and production. Master of A.I.D. requirements and latest practice.—Apply Box No. 2059, THE AEROPLANE, 166, Piccadilly, W.1.

Works Manager, or would take charge of outside erection or experimental work. Shortly disengaged, 36, practical engineer and aero-constructor, having invaluable experience of both seaplanes and aeroplanes, being exclusively engaged in manufacture of complete machines, strict discliplinarian, tactful controller of labour, energetic, keen and methodical organiser.—Apply Box No. 2057, THE AEROPLANE, 166, Piccadilly, W.1.

Engineer (practical man) seeks berth as works foreman or superintendent; 9 years' aircraft experience; excellent references.—Box No. 2095, THE AEROPLANE, 166, Piccadilly, W.1.

Mechanic, 4 years' experience on aircraft, previous experience on engines, accustomed to taking charge of machines, running of engines, etc., preparatory to acceptance, and experimental tests, seeks responsible position at either aerodrome or works.—Reply Box No. 2087, THE AEROPLANE, 166, Piccadilly, W.1.

Sawmill Foreman.—Position required by present night charge-hand, well up in drawings and R.E., B.E., and Sopwith machined woodwork.—Apply Box No. 2090, THE AEROPLANE, 166, Piccadilly, W.1.

Advertiser, Engineer, aged 36, desires remunerative position as works manager in factory building complete machines or spares. Thoroughly competent in all departments, accustomed to modern methods and quick production of wings, fuselages, propellers, undercarriages, etc. Salary, £4/500 per annum. Reorganisation or new company. Every inquiry invited.—Box No. 2091, THE AEROPLANE, 166, Piccadilly, W.1.

Air Pilot desires position, experienced in general construction of aircraft and in internal combustion engines.—Box No. 2081, THE AEROPLANE, 166, Piccadilly, W.1.

Practical Aeronautical Engineer with 7 years' experience of aeroplane and seaplane manufacture and of aviation in all its branches. Three years' shop experience; practical organiser; at present engaged as works manager of aviation firm. Is prepared to make a change in the event of a suitable offer being received; or would submit practical proposition to any firm or individual wishing to take up aeroplane manufacture.—Box No. 2092, THE AEROPLANE, 166, Piccadilly, W.1.

Ex R.F.C. Officer, thorough disciplinarian, with extensive commercial engineering experience and good knowledge of service aeroplanes, desires responsible position on staff of established firm, preferably to take charge of finished article prior to delivery, or post as outside representative: interest in business considered.—Box No. 2094, THE AEROPLANE, 166, Piccadilly, W.1.

Works Foreman or Manager wants engagement. Mechanical engineer, 34 years' practical experience, well conversed with modern machinery and up-to-date tools for aeroplane parts.—Box No. 2088, THE AEROPLANE, 166, Piccadilly, W.1.

Aircraft.—Gentleman with 20 years' practical engineering and motor-car experience; 7 months' aircraft and flying, desires position of trust. London district only.—Box No. 2089, THE AEROPLANE, 166, Piccadilly, W.1.

Works Manager seeks re-engagement with aircraft firm. Practical aero-constructor of complete machines and spares. First-class organiser, strict disciplinarian, and thorough control of male and female labour through all departments.—Box No. 2026, THE AEROPLANE, 166, Piccadilly, W.1.

As Foreman of propeller shop or other woodworking department. Practical man, good organiser, knowledge of Government requirements.—Box No. 2086, THE AEROPLANE, 166, Piccadilly, W.1.

Pitter-erector requires post as charge-hand as previously held. Good experience, both shop and aerodrome work.—Box No. 2085, THE AEROPLANE, 166, Piccadilly, W.1.

Gentleman, recently discharged from Army, with three years' engineering experience, wishes to enter aircraft works.—Box No. 2084, THE AEROPLANE, 166, Piccadilly, W.1.

Cost Clerk seeks engagement; six years' experience in sole charge of aeroplane estimating and cost-keeping department. Good organiser. Not eligible for general service. State terms to J, 284, Rustic Avenue, Welling, Kent.

To Aeroplane Manufacturers.—Young capable engineer desires position as general or works manager; fully conversant with up-to-date methods; first-class references; at present in charge of aeroplane factory employing considerably over 1,000 hands. South Coast or London district preferred.—Write Box 5096, Willings, 125, Strand, London, W.C.2.

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Edited by C. G. Grey

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ON THE COMFORT AND SAFETY OF PILOTS. II.

GUN POSITIONS.

There is another point in design on which those responsible might well keep an eye. It may be noticed that in nearly all German aeroplanes the forward machine-gun is placed to one side of the cockpit, instead of directly in front of the pilot's face. This is necessary in German aeroplanes, because the big vertical cylinders make it impossible to place the machine-gun in the centre of the cowl.

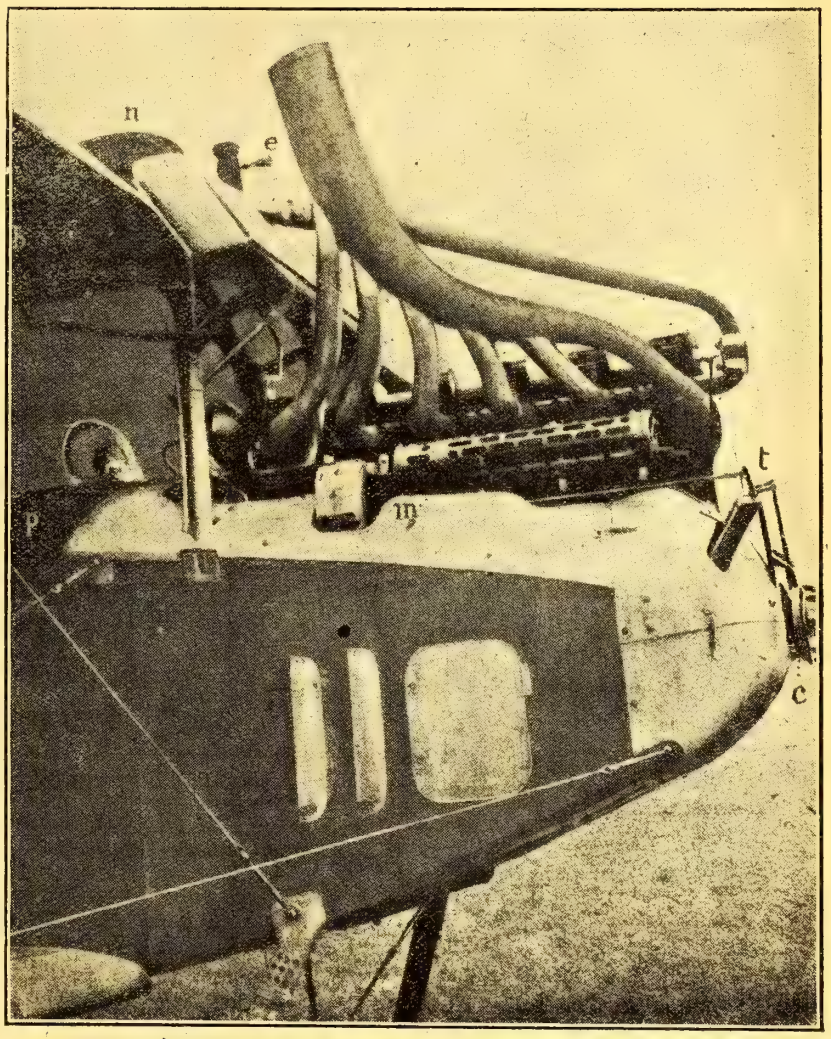
Apart from that, however, there is a very real advantage in having the gun elsewhere than directly central, where, as a fighting pilot puts it, the gun is "just in front of the pilot's nose—presumably as a warning not to crash." With the spade-handle of a fixed gun projecting backwards into the "boudoir," if the pilot does crash, he is practically bound to fall face first into the gun.

A young friend of mine completely ruined the sight of one eye in precisely this way some months ago, in a smash which otherwise would not have hurt him at all. He was flying a very fast scout with an experimental engine at an aerodrome which has a high broad bank along one side. While he was over the wrong side of the bank, his engine petered out and he started to glide for home, as there was no possible landing place under him. With great skill and judgment he just managed to reach the bank by practically stalling the machine onto the top of it. The machine trickled gently across the top of the bank, just got its nose over the far edge, and stood quietly on its head in the aerodrome at the bottom.

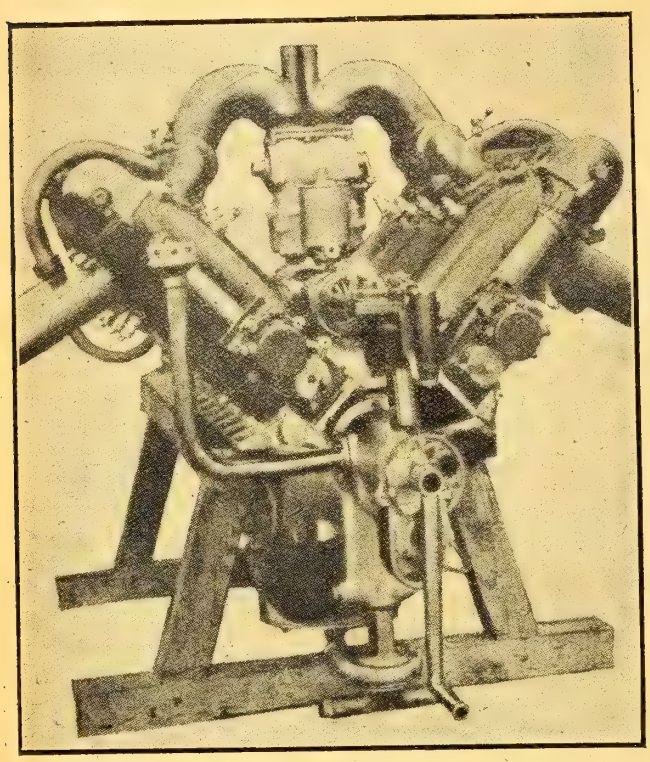
The pilot climbed out and stood beside the machine, apparently unhurt; but when the mechanics reached him, they found him nursing one eye, and he explained that, although he had not been pitched hard into the front of the machine, his head had just bobbed forward, so that one eye caught the corner of a padded board which had been placed across the double handles of the gun, with the laudable intention of saving the pilot's face. The corner of the buffer-board had pushed a hole in his Triplex goggles—which, be it said, were not splintered—and had smashed one of his own glasses into his eye, cutting certain very necessary eye muscles.

I doubt whether he would have got off much better if he had not been wearing glasses under his goggles, for the corner of the board went clear through the goggles, and would probably have forced itself or the torn Triplex stuff into his eye in any case; but it is perfectly certain that, if he had had ordinary glass goggles instead of Triplex, he would have had his eye gouged clean out. It is not my habit to give testimonials in these columns, but in this case such testimony is thoroughly well deserved.

Anyhow, there are plenty of better places for gun-butts than right in front of the pilot's nose, and, though it may be worth while to put the gun in the centre if one is going to fire through the cam-shaft of a V-type engine, it does not matter much where else one puts the gun with any other type of engine in these days of interrupter gears and indirect sights and such refine-



The Machine-gun alongside the Mercédès Engine on an Albatros.



(Reproduced from "Aerial Age," New York.
The Starting-handle of the engine and the Spade-handle of a Lewis Gun fitted in the V of a Hispano-Suiza Engine.

ments. With twin guns, of course, the question of central gun-fittings does not arise.

Night Landings.

One of the worst dangers of aviators in these days, or rather nights, of nocturnal raids, as in the Zeppelin period, and with the remarkable increase in night fighting at the front, is landing in the dark. In clear weather, landing with the improved types of lights now used is fairly simple, at home anyhow. Abroad it is rather another matter, for I gather that the wily Hun has a nasty habit of sending over a number of bombing machines in company with our returning bombers—at a respectful distance above them—and then, when the landing lights are switched on, down comes a shower of bombs on the aerodrome.

The results of these return-raids have not been great, it seems; but they are distinctly annoying, and they have, at any rate, the effect of putting out the landing lights for the time being, and compelling our people to flop round in the dark, or chance landing without lights.

There seems room, therefore, for some ingenious individual to perfect a really sound method of indicating to a pilot precisely how far he is above the nearest ground. The aneroid is no use, because it only shows height above sea level, or the original starting place. There is the classic instance of the pilot who started from the Thames Valley to strafe Zeppelins, and who, after flying all over the country for hours, decided to look for a landing somewhere. He descended boldly to 1,100 feet, by aneroid, and then edged gingerly down to 1,000 feet. There he began to look over the side, expecting to see a light of some sort or other when so low. Suddenly he landed with a crash and deleted his under-carriage quite successfully on a grass field without hurting himself. When he came to investigate, he found that he had just happened to hit off the top of Leith Hill, which is about the only ground above 500 feet high for a hundred miles or so.

There is also the case of the late Mr. Jacob Delaval Astley, more commonly known as "Otto." He started from Hendon in the "Circuit of Britain" on a Birdling monoplane, and flew into a fog. He kept steadily at 300 feet, flying due north by compass, and in something less than an hour found himself rolling smoothly along a perfect grass field near Bedford, where the ground rises to just the necessary 300 feet. Doubtless there are many similar cases, besides many more in which the pilots have been less fortunate.

One Way of Doing It.

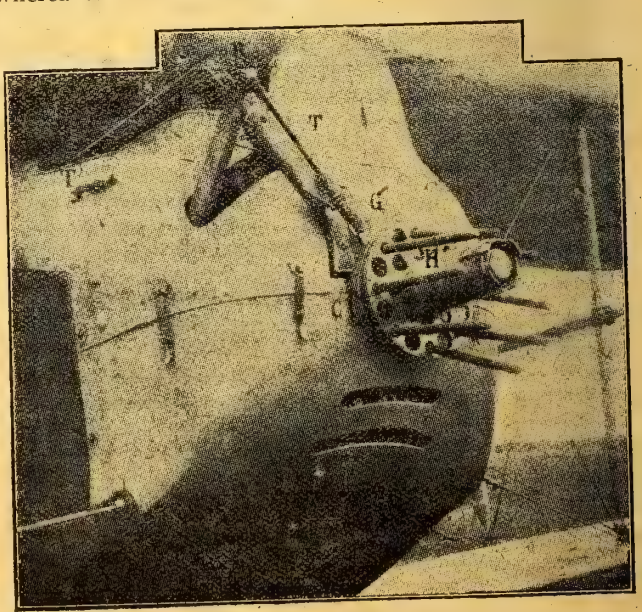
Some considerable time before the war a certain aeroplane maker named Pemberton-Billing, of Southampton, devised what he called a "super-meter," which was a plumb-line let out of the machine when the pilot thought he was near the ground, or the water, in darkness or fog. When the plumb-bob touched anything, land, water, trees, houses, or such things, the line rang a bell, or lit up an electric lamp, or played a tune, or did something diverting to attract the pilot's attention and warn him to switch off and land.

The idea was quite sound then, and seems more so still to-day. There are several ways of making the device work successfully, and it now seems well worth reviving, both for use at sea over perfectly calm water when one cannot see the surface in daylight, and over land or water in the dark. If anyone can think of a better way, it is well worth their while to go on experimenting till they have perfected the idea.

If a way can be devised of telling the height of a machine above the ground without a trailing line, so much the better, for if the line catches a tree or a house-top it gives its warning just as if it had touched open grass, and so may be dangerously deceptive. On clear nights a machine can drop flares to show what is below it, or use other means such as those now in use which must not be described, but in fog no sort of light is of any use, so there is an opportunity here for some inventive genius to assist the mental comfort of pilots.

Seeing in the Dark.

Various papers, commenting on recent aeroplane raids by night, have referred to the difficulty of seeing aeroplanes in the dark, either from the ground or when in the air. One recalls that in the early days of Zeppelin raids, when Paris was supposed to be defended by night patrols of aeroplanes, the said aeroplanes carried searchlights with which they were supposed to pick out the whereabouts of the invaders. It was pointed out in



The Nose of an Albatros, showing the synchronising Gear which fires the machine-gun.

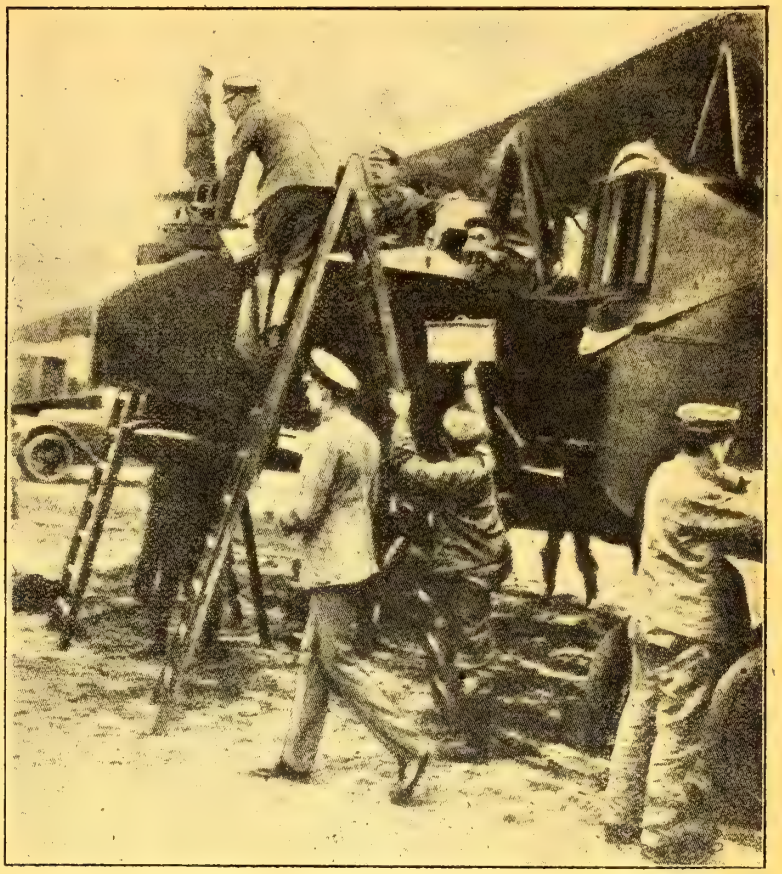
this paper at the time that these searchlights served equally well to show the invaders the whereabouts of the patrols, so that they could be avoided.

This objection is still more true in the case of the swifter and more quickly manœuvred raiding aeroplanes. Moreover, dispatches from G.H.Q. in France have described how our fighting machines, accompanying bombers at night, have dived at the enemy's searchlights on the ground, and have pumped bullets into them till they have gone out, whether because they have hit the light or because they have worried the crew into switching off is not clear.

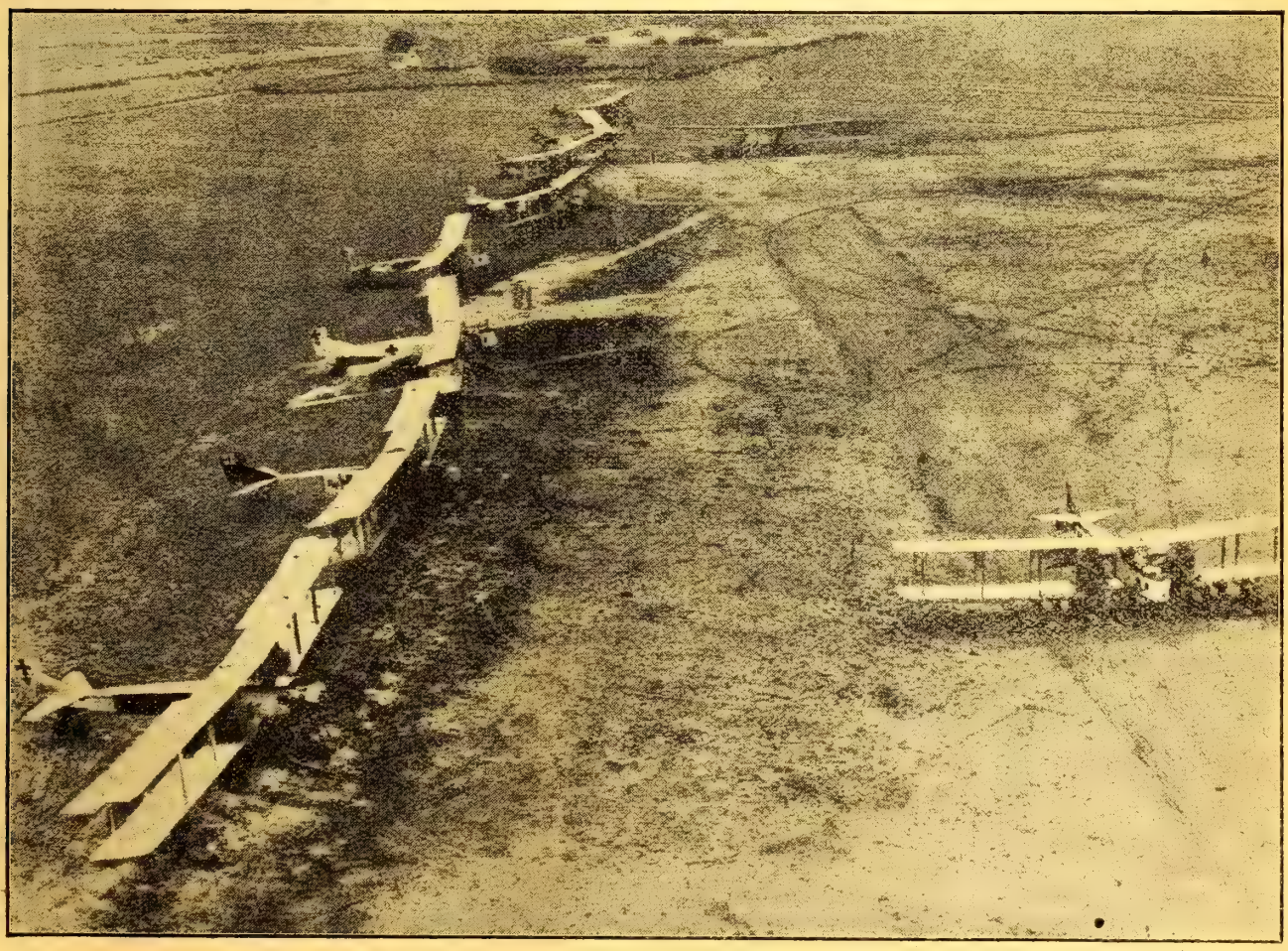
When one remembers the blinding glare of a searchlight, it seems unlikely that the gunners on the aeroplanes were able to fire direct into the face of the light itself, but they may have fired at the base of the beam without actually flying into the beam itself. But, in any case, if it is possible to put out a searchlight on the ground by firing into it, there seems something like an equal chance of hitting an aeroplane which is carrying a searchlight—at any rate, if the light is kept going for more than a few seconds at a time.

An Opportunity for Inventors.

Very possibly some means, unknown to the omniscient Press, has already been found of spotting enemy aeroplanes in the dark. If so, we shall doubtless see the result whenever the enemy attempts that really big raid about which he has



Loading up a Gotha Raider before starting.



A Gotha Raiding Squadron Starting. The smooth starting place is of interest.

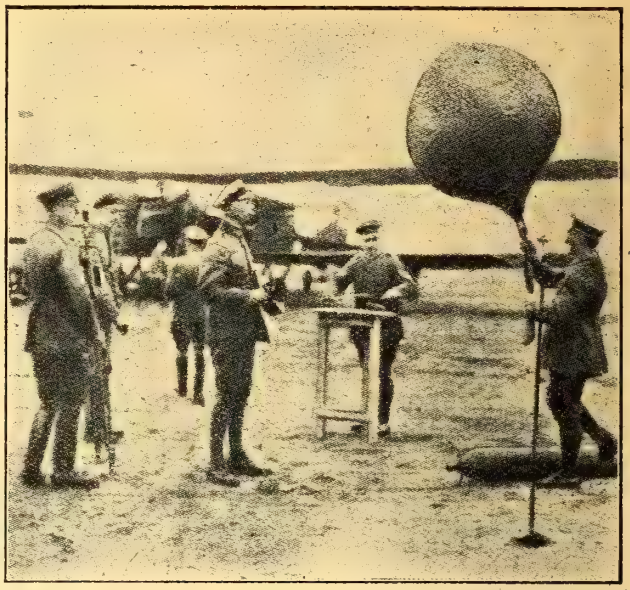
been talking so much since the "trial trips" of the last few months. That is, of course, assuming that the continual raids by the R.N.A.S. on his aerodromes in Flanders fail to prevent him from assembling enough machines at once to make up his raiding fleet to the desired strength. At present he seems to have considerable difficulty in replacing the machines smashed in their own aerodromes by the R.N.A.S. bombs, but it is just as well to be properly prepared.

Also, it is difficult to have too much of a good thing, so even if we have an officially approved method of spotting invaders at night, it may be well to have an alternative method. Therefore, if any of our thousands of brilliant inventors have ideas on the subject, they may as well go ahead with their development, and send them along when they feel sure they will work. It may be well to remind inventors that anything in the way of lights thrown on raiders from above will illuminate the ground below, and will help the enemy in the accuracy of their bomb-dropping, so parachute flares dropped from high-flying aeroplanes can be washed out for a start.

Life-Saving Parachutes.

Talking of parachutes, it occurs to me that we have now reached the stage when parachutes might well be used as life-buoys on aeroplanes. Everyone knows how successful they have been in saving the lives of observers in kite-balloons when set on fire by enemy aeroplanes. Hitherto, however, they have had little chance of usefulness on aeroplanes.

In the early days, if an aeroplane got out of control at a height of 2,000, or 3,000, or even 5,000 feet, either through breakage or through being shot about by the enemy, the pilot probably wrestled with it in the hope of regaining control till so near the ground that it would have been too late to jump out with a parachute. Also, the old, heavy, voluminous parachutes, with their tangle of cords and fabric, were so unreliable in opening when released in a bundle, and not slung by the centre and left hanging straight down below a balloon like a closed umbrella, that the risk of taking to a parachute was probably greater than the risk of sticking to the machine.



Sending up a Test Balloon to find the true direction of the Upper Wind before starting a Gotha Raid.

Now, however, circumstances have altered considerably. Machines are shot down at anything between 10,000 and 20,000 feet. In such a case a pilot has a matter of minutes in which to make up his mind whether the machine is going to come under control again or

The Pilot and Observers of a Raiding Gotha dressing before going aloft for a Raid. The Photographs are reproduced from a Hamburg paper.

not. Furthermore, the modern parachute, say, of the Calthrop type, is so much more compact that it can be carried on an aeroplane with ease, and is so much more certain of opening that it really has become a reasonable proposition as a life-saver.

It is now a good many years since the gallant little Pégoud demonstrated that it was possible to jump from an aeroplane with a parachute and live. Naturally there is a big difference between quitting the slow old Blériot of the period and getting out of a high-speed modern machine in the process of an uncontrollable spin.

Still, the mere speed of the machine should make the parachute open all the more quickly, provided that the parachute could be thrown up into the air behind the machine, and that the pilot was not expected to fall away below the machine and drag the parachute out of its pocket with his weight, as he does when quitting a balloon.

A case where a parachute would almost certainly have saved the pilot was that of the late Captain Cole-Hamilton, who, according to fairly reliable witnesses, manœuvred down with a partially broken wing for several thousands of feet before the wing finally gave way and made the machine utterly uncontrollable. Also in cases of fire, such as those already quoted in reference to petrol-release gadgets, parachutes thrown well up behind the machines might have saved the pilots and passengers.

Parachute Storage.

This method would not, I fear, apply in the case of "pusher" machines, but there seems to be no great difficulty in applying it to tractors. Also, the streamline fairing on top of the fuselage proper, and raised up behind the pilot's head, would provide a nice neat locker in which to store the parachute in a single-seater. In a two seater this space would take the passenger's parachute, and the pilot's would either go into the space between the two cockpits or perhaps into a hole in the upper plane. The storage space for the parachutes is, however, a matter which might well be left to the ingenuity of the aeroplane designer. Cases would, no doubt, occur in which the parachute in opening might become tangled in broken pieces of the machine, or in which the parachute itself might be set on fire, but even so it would never increase the pilot's risk, so far as I can see, and it would almost certainly save a number of lives.

I do not know what devices the ingenious Mr. Calthrop has produced for launching parachutes clear of aeroplanes, as opposed to merely dropping them from balloons or airships, but the problem does not seem difficult to solve. One young R.F.C. officer (invalided out), whose name I have unfortunately forgotten at the moment, showed me some months ago quite a reasonable method of launching a parachute from an aeroplane. If he happens to read these notes, I shall be glad to hear from him how his experiments are progressing.

In any case, I commend to the High Authorities the consideration of these suggestions. If it were practicable to use parachutes as emergency exits from damaged aeroplanes, and to carry them so that they would not interfere with the aeroplanes' performances, it seems that they would afford considerable mental comfort to pilots, and might save quite a reasonable number of lives. Many of them might never be used at all—and so much the better—but, in time of peace, anyhow, one does not expect every life-buoy on board ship to save a life, so, on similar lines, it would be enough if the parachute, like the policeman, could adopt the motto, "I'm there if I'm wanted."

All these points may seem trivial in themselves to people who think of pilots and aeroplanes by the hundred of thousands, and who picture to themselves vast fleets of aeroplanes darkening the sky of Germany, but in the end it is the pilot who counts for most, and, if one can save the lives of a few pilots and give them more comfort during their flying lives, it certainly seems worth doing.—C. G. G.

ON THE BEGINNING OF THE RAIDING SEASON

The German is really a very simple-minded person. So much so in fact that he frequently takes one by surprise by doing things that are so obvious as to seem hardly worth doing. Take Monday night's performance as an example. The moon, which was about a half-moon, was due to set at about 9.30 p.m., so the raiding Huns appeared just before nine, on about the first clear, calm night for the last six weeks. Obviously it was the right thing to do, because the return journey would be in darkness, so that they could not easily be caught and headed off from home by the Allied aviators at Dunkirk.

They must have left Belgium pretty well in daylight, but, at the moment of writing, it is not known whether any of them were caught and brought down by the R.N.A.S. people on the outward journey. The patrol of the short strip of coast from Dunkirk to Flushing would be, naturally, the chief duty of the R.N.A.S. fighting machines, just as the bombing of German aerodromes in Belgium whence these raiders start would be the chief duty of the R.N.A.S. bombing machines in Flanders.

Such duties are an integral part of the defence of London, and if those forces, being on the wrong side of the Channel, cannot be directly under the command of the G.O.C. London defences, they would obviously be in the closest touch with him and his staff. For the matter of that there would be nothing more incongruous in putting them under a General Officer who is at least intimately concerned with aerial defence work than in putting them under the Admiral commanding Dover patrol, consisting as it does of ships which have little or no interest in aircraft.

At any rate, so far as the defences of London itself are concerned, they are in excellent hands, and one may rest assured that all is being done that can be done to deal as effectually with night air raids as our aviators dealt with Zeppelin raids of last year. There are certain inherent difficulties in connection with night fighting which may at first be difficult to overcome, but they will be overcome in time just as the Zeppelin nuisance was overcome.

Zeppelins.

Zeppelins, it may now be noted, are only used for sea work, and for attacks on minor cities which the invaders have reason to believe are not heavily defended by guns and searchlights. Even then the venture is hazardous for the Zeppelins owing to the increasing effectiveness of our night-flying aeroplanes—which is likely to increase still further.

It seems probable that the Zeppelin raid on the Yorkshire and Lincolnshire coast on Monday night was in the nature of a reconnaissance to discover whether

our night flying machines had been withdrawn from the North in order to protect London against nocturnal aeroplanes. Probably the Zeppelins have discovered that any such assumption is erroneous, and that the anti-Zeppelin aeroplane differs considerably from the anti-Gotha aeroplane. I use the word Gotha generically for all big bomb-dropping aeroplanes in this instance.

At the same time it would be foolish to disregard the Zeppelin entirely, or to assume the complete veracity of stories from Germany which would have us believe that all Zeppelin and other airship factories have been transformed into shops for the production of big bomb-dropping aeroplanes. It is necessary still to maintain a reasonable force of anti-Zeppelin machines in the Provinces.

The Real Defence.

So far as the defence of London is concerned, I am more than ever convinced that it should be chiefly defended from Dunkirk rather than from its own environs. It is easier to patrol from Nieuport to Flushing than round the whole periphery of London at a radius of twenty miles from Charing Cross. Also, systematic bombing of German aerodromes in Belgium by a force of our big bomb-droppers detailed exclusively for that purpose under an energetic and intellectual officer, well served by an efficient intelligence department, and quite independent of any Naval or Military command in the same area. As suggested before, this force might be under the G.O.C. Home Defences, but it should certainly not be under any other command which could divert it to the advertisement of sea forces or to the affairs of the Army.

Warnings.

As I have stated already in another place, I am strongly of the opinion that warnings should be given of night raids, for preference by bombs, as in the case of day raids. The shock of being awakened by the explosion is modified if one knows that it is only a warning and not the real thing. Also, there is definitely a protection in being up and dressed when a raid begins.

Delicate persons shivering in cellars or in cold concrete passages in their night gear are more likely to die from the effects of the cold than from the bombs, and nothing will quite remove the idea that the basement is the safest place, or prevent nervous people from going there.

Moreover, in case of a house being damaged by a bomb, a fully dressed and shod person climbing out of or over the wreckage is less likely to be seriously injured than one clad only in night attire. Again, if the inhabitants of a damaged house are forced to quit it in a hurry and cannot return to it, they will be in a better position to attend to their affairs next day if they leave properly dressed than otherwise.

On the other hand, I can see no good reason whatever against giving warning of an impending raid. If the signal bombs are constantly ready at the various fire stations, they can be sent up as easily at night as by day. My plea is simply for a "dressing bell" warning a quarter of an hour before the raid arrives, and I suggest that my reasons are sound. Quite apart from the fact that the average man will agree that a chap does look a silly ass in his pyjamas in the street, and quite apart from the views of either sex as to the charm of feminine déshabillé, I think most people would prefer to be told that a raid was arriving.

Meantime we may regard the recent raids merely as preliminary skirmishes. It depends, I fancy, more on the Supply Department of the Air Board whether the really serious aerial engagements of the future take place over London, over the country of our unfortunate Ally Belgium, or over the German industrial cities along the Rhine. The last is presumably preferable as the war area, and such a preference may be made effective if the supply problem is tackled intelligently above and honestly below.—C. G. G.

REPRISALS.

By W. Barnard Faraday, LL.B., Barrister at Law, Secretary of the Aeronautical Society.

There is a great deal of talk about reprisals to-day. This, in view of the anger stirred up in London by the deaths of women and children, is to be expected for feeling runs high. It is curious to note, however, that the military value of reprisals is merely a secondary part of the discussion. What the public—or that section of the public which expresses itself in the newspapers—is in doubt about is the morality of the proceeding. This discussion is in general very loose and ill-informed, and it is in the hope that I may be able to assist people to a conclusion that I venture to add my voice to the clamour.

In my opinion "reprisals" are just as moral as the execution of a murderer, the imprisonment of a thief, or the killing of an enemy soldier by troops defending their home-land.

What do we mean by reprisals?

There exists, in what used to be the comity of nations, a body of law which is called "Public International Law." This regulates intercourse, either peaceful or belligerent, between nations. It fixes their relations and tells them how they must behave. Treating States as persons, Public International Law is to the family of nations what English law is to English citizens, or French or other law to the citizens of France or other countries.

Now if an Englishman breaks an English law he is punished, because the State enforces its own laws by bringing to book those who violate them, but if a nation breaks an International Law, there is no supreme authority over the family of nations to punish the offender. Hence we have a saying that "International Law is no law at all."

It is this that Germany is relying upon. She has violated International Law again and again, contemptuously and arrogantly, because she thinks that there is no one to punish her.

Now if the facts were really like this, humanity would be in very bad case and at the mercy of any bumptious and unscrupulous State that chose to violate decency, but, fortunately, there are two methods of enforcing public order. The first of these is the unwillingness of any people to permit their government or military forces to do anything openly barbarous or contrary to human usage.

In the case of Germany, the public conscience is by no means a sensitive once, and this method may be ignored without injustice to the moral sense of the Teuton Empire. The other method is the only one left to us, and that method is "Reprisals."

Now limiting the matter to war (for reprisals do not necessarily mean killing people, and are not unknown in peace), reprisals mean briefly that if A does something wrong to B, B can protest, he can invite neutral nations to remonstrate, he can appeal to such International Tribunals as there may be. If none of these things are of any use he can resort to reprisals.

Now in the present case there are no neutral nations competent to remonstrate; there is no International Tribunal worth a yard of pink tape, and we have already protested. Therefore, provided the Germans have violated International Law in dropping bombs on London from the air, we have the right to punish Germany by violating the same law that she broke herself to such extent as will make her realise her wrongdoing.

The legal definition of reprisals under these circumstances would be "Acts of Retaliation by way of special punishment inflicted on enemies guilty of breaking the laws of war."

Is the dropping of bombs on London against the laws of war?

It is maintained, a defended fortress or town being liable to bombardment or assault, that the Huns have a perfect right (London being in a sense defended) to bombard it, attack by aircraft being in effect bombardment. It is, however, an accepted rule that no place containing a civilian population may be bombarded unless 24 hours' notice be given, the principle being that the risk to innocent civilians must be reduced as low as possible.

Now each raid is not part of a continuous bombardment, but is a distinct and separate attack, and strictly, every time the Huns drop bombs they ought to give 24 hours' notice. It is manifest that the Huns' reply to this contention would be similar to that which they gave in the submarine argument—"if we give



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BOMBAY, Hughes Road, Cumballa Hill



notice we might as well leave the business alone; these are new weapons, the result of our Kultur; why should we be handicapped by out of date rules?"

To this there can be only one answer. "It is true these are new weapons, but you must make your weapons fit the law, not alter the law to suit your weapons, and if you break the law we will punish you."

In a word we should be entitled to make reprisal, if the German Government did not comply, in both letter and spirit, with the various International Congresses and Conferences which have laid down the laws of war.

Reprisals need not be in kind. When Dr. Crippen poisoned his wife, the State did not poison Dr. Crippen. They hanged him. When Bill Sykes stole a pair of boots, the State did not take Mr. Sykes's boots. They put him in prison. Just so, when Germany commits unlawful outrage on us we need not commit the same sort of outrage on her. We are entitled to do something unpleasant to her as a punishment, that we should not otherwise have the right to do, by such means as we find most immediately convenient.

Reprisals may be by air, earth, fire or water. They should be clearly announced and promptly follow the crime. Reprisal by air most appeals to the popular fancy, and there is much to be said for it. Reprisals for the ill-treatment of British prisoners in Germany, the murder of Miss Cavell, the submarine outrages, and the air raids on London—these could be made by bombing Cologne, Essen, Berlin, Pumpernickel and Koepenik, or any other seat of German civilisation that captured the Air Board's vagrant fancy.

Whether reprisals of another sort have not already been made, or whether air raids on Germany are desirable or possible in the military sense, are questions outside the scope of this article.

TURIN TO LONDON.

From "The Times" of September 25th.

A remarkably fine feat was achieved yesterday by Captain the Marquess Giulio Laureati, of the Italian Air Service, who for the first time completed the journey from Italy to England by air without a stop. He left Turin at 8.28 (Italian time) yesterday morning, and landed at Hounslow at 2.50 in the afternoon, having completed a journey of 1,050 kilometres (656¼ miles) in 7 hours 22 minutes and 30 seconds.

Captain Laureati flew an S.I.A. machine, and carried a passenger, Air Mechanic Michael Angelo Tonzo, and two machine-guns. From Turin he followed the railway as far as Susa, on the Italian frontier. Crossing the Alps by the Mont Cenis at an altitude of nearly 12,000ft., he passed over Lanslebourg and rejoined the railway at Modane. During the crossing of the Alps he encountered rough weather, and throughout the whole of the journey he had to face a strong north-westerly wind.

From Modane, still following the line of the railway, the aviator travelled north-west to Culoz, which he reached in 1 hour 40 minutes from Turin, and continuing on the same line passed over Verdun-sur-Doubs. He crossed the Cote d'Or, and proceeded by way of Flavigny and Bussy, across the Seine and the Marne, passing to the east of Paris, and completing his transit of France by way of Compiègne, Amiens, and Cap Gris Nez. Throughout this part of the journey he kept an average height of about 9,900 ft. He crossed the Channel in 15 minutes, dropped to 2,000 ft. to pick up his bearings at Lympne, and completed his journey to Hounslow without misadventure, except for a slight détour made in error over Hendon

He carried with him, in addition to copies of yesterday morning's issue of the *Gazeta del Popolo*, an autograph letter from his King to King George, and letters to Mr. Lloyd George, Lord Derby, Mr. Balfour, Lord Montagu of Beaulieu, and the Lord Mayor of London. He was met on arrival by Admiral Mark Ker, on behalf of the Admiralty, Major Gerald Tharp, representing the War Office, and Major Stonor on behalf of the Air Board, Colonel Mola, Italian Military Attaché, Princess Potenziani, the Duke and Duchess of Mondragone, Marquess Theodoli, Baron Mayor des Planches (Italian High Commissioner), Prince Borghese, and other members of the Italian Embassy staff, and a number of Italian officers. He was none the worse for the journey. The Italian officers and British aviators carried him shoulder high from his machine amid much cheering, and before he left the aerodrome he was enthusiastically greeted by numbers of British flying men and mechanics.

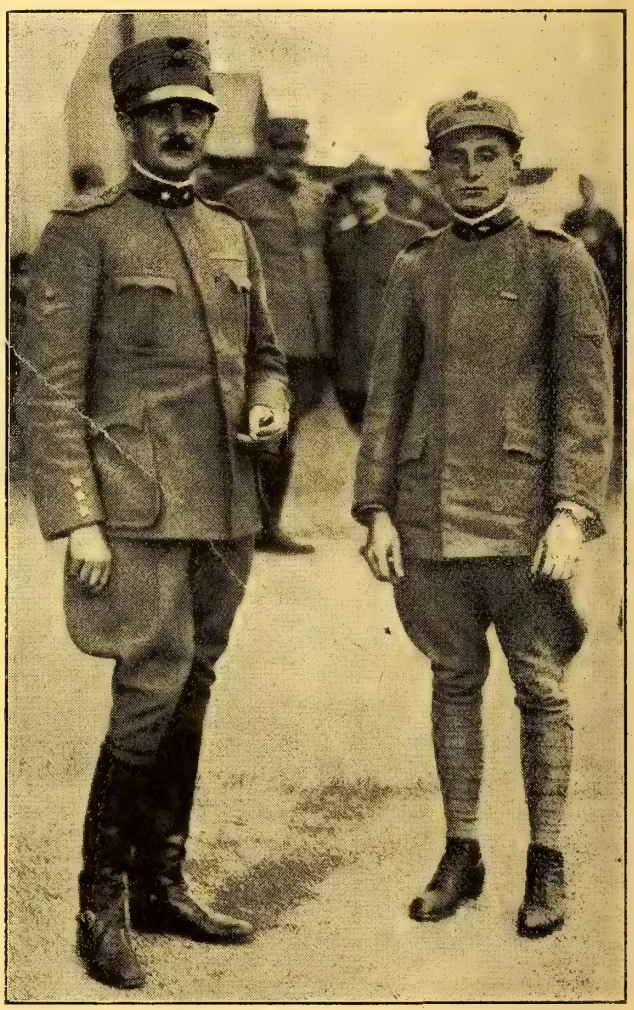
During the flight he took food from a bottle fastened inside his coat and fitted with a rubber tube like an infant's feeding-bottle, but he landed with a hearty appetite.

Captain Laureati distinguished himself on August 26th by making a journey from Turin to Naples and back, a distance of 920 miles, without descending. He is a handsome man of sturdy build, about 40 years of age. He wears the ribbons of the Bronze Military Cross, the Silver Military Cross, and the red, white, and green ribbon of the present campaign.

Captain the Marquess Giulio Laureati was born at Grottamare (Marche), on July 11th, 1877, and is therefore 40 years of age. He is a married man. He began flying privately for pleasure in 1908, since when he has used practically every known type of plane. He entered on his military career in the Air Service of the Italian Army in 1911, and received his official warrants as a pilot in 1912. In the present war he has bombarded the Austrian lines no fewer than 25 times, being a specialist in this branch of aerial activity, for which he employs a Caproni plane.

Last night Captain Laureati was honoured with a message of congratulation from the King.

[In connection with this flight it is well to recall that in July Sous Lieut. Marchal flew from Nancy 800 miles across Germany and landed, owing to plug trouble, only a few miles short of the Russian lines. Also, in June, 1914—before the war—the German aviator Suvelack, with a passenger, flew from Berlin to Eggré Palanka, on the Turkish-Bulgarian frontier, just on 1,000 miles, without a stop.—Ed.]



Photograph by "Sport and General."

Captain the Marquess Giulio Laureati and Gunner-Mechanic Tonzo, on their arrival in England.

KITE-BALLOON ACCIDENTS.

The breaking away of a balloon from its moorings in the outskirts of London on Sept. 21st led to two deaths. The wind was strong and gusty, and the runaway balloon turned over and threw out the occupant of the observation car, a Royal Flying Corps officer. He was killed, the body being picked up shortly afterwards.

The cables of this balloon appear to have become entangled with those of other captive balloons, which were up at the time, and tore three of them away. Apparently only one of these balloons carried an observer.

Loosely connected by their entangled cables, the four balloons travelled away in the breeze, and it was noticed that the observer had failed to get clear by using his parachute, and was hanging amid the wires. About 1 o'clock the four balloons passed over South Norwood, and the observer fell from a height of 2,000 ft. into a field on South Norwood Hill. He was killed instantly. The body was removed to the mortuary at Croydon. The runaway balloons now carried no other human freight, and, it is stated in the Press, that they were shot down by anti-

aircraft guns, though it seems unlikely that live shell would be fired in other circumstances than those of an air raid.

There was considerable excitement in South-West London on Sept 20th when an observation balloon was seen to catch fire while passing over the Victoria district. The gas had apparently ignited, and the balloon, rapidly rotating at a low altitude, drifted across the river towards the Surrey side. While over mid-stream the aeronaut released a parachute, and, watched by thousands of fascinated people, leapt with it from the basket and made a spectacular descent just below Chelsea Bridge on the south side of the Thames. He landed uninjured, while the remains of the balloon sailed about five miles further, and fell at Dulwich.

MONDAY'S RAID.

The following account of the air raid of September 24th is taken from "The Morning Post":—

The first of the raiders appeared over the South-Eastern district of London about five minutes past eight, and he was immediately followed by others from the same direction. The anti-aircraft guns of the London defences were brought into action, and it was stated that a considerable number of British aviators were co-operating with the defence batteries. From eight o'clock until 9.25 the anti-aircraft guns were continuously in action. During the attack star shells were frequently employed in order to assist the searchlights, but save in rare instances the majority of the raiders remained undetected. The explosions caused by some of the missiles were deafening. The public, although taken completely unawares, behaved splendidly, and betook themselves to the shelters which had been provided in the City and West End.

AIR RAID WARNINGS.

The following directions on the subject of shelter from air raids issued by the Commissioner for the guidance of the police are published for general information:—

When the "Take Cover" notice is given the public are advised, if in the streets, to get out of them, if in their homes, to remain there. During daylight hours there is no difficulty in securing shelter in a building, but it is essential that it should be in a building that affords the protection of an intervening wall or other similar obstruction of substance. An open area below ground level affords good protection against a bomb exploding in the street.

All police stations will admit throughout the 24 hours to the full extent of their accommodation persons seeking shelter there. During the hours when they are open, the public in galleries, museums, public libraries, and other places of public resort will be allowed to remain on the premises till the raid is over.

The tube and other railway stations which provide secure shelter will admit the public without charge, as long as the stations are open for traffic, and if already sheltered there, till the raid is over, and police arrangements have been made as far as practicable for the regulation of the persons congregating there. Elsewhere there are numerous other buildings affording good shelter which will be made available both day and night for the purpose. At all police stations there is a list of those premises considered suitable.

The managers of premises affording shelter (particularly at night) are invited, upon the issue of the "Take Cover" notice, to exhibit a placard with the inscription, "Air Raid—Shelter." They can obtain this printed inscription on application at the local police station, and should have it mounted on a board for exhibition. As the managers at night may not know of the issue of the "Take Cover" notice, constables, special and regular, will as far as practicable be detailed to apprise them and assist in regulating the persons admitted.

The Lord Mayor of London has received a memorial signed by some hundreds of resident City housekeepers, appealing for more efficient night warning on the approach of hostile aircraft. The majority of housekeepers, they say, sleep on the top floors where the "take cover" warning cannot be heard. If more efficient means could be adopted, it would be possible to convey the women and children to the comparative safety of the basements.

GUARDIANS ON STRIKE.

At a meeting of the Poplar Guardians on Sept. 20th, Councillor Sumner raised the question of the refusal of the London Country Council to give effect to a resolution passed by the Borough Council a month ago, to open all public buildings as shelters or refuges during air raids. The speaker said that if the London County Council persisted in their attitude, the Borough Council were determined to refuse to pay their contribution towards the county rate.

Councillor Adams seconded a resolution of indignant protest, and said that if the schools and other buildings were not opened by the London County Council as requested by the Borough Council, he would make one of a number to go with iron bars and break them open.

Mr. Henry Heath, a past chairman of the Board, agreed with the resolution which was carried unanimously.

THE WORK OF THE BROTHERS BARNWELL.

One who worked with the late Harold Barnwell from the earliest days of aviation sends some additional information which is of considerable interest:—

In 1908 the Brothers Barnwell built a curious "canard" type monoplane. This machine had an air-cooled 90 degree V-twin engine, designed and built by Harold Barnwell. Both the brothers made attempts to fly it, but it never left the ground and its speed over the ground was not much over 20 m.p.h. In 1909 the brothers built the biplane which was illustrated in the obituary note on Mr. Harold Barnwell. In this case Harold Barnwell did two flights, both of which ended in crashes.

The brothers then tried what they thought would be a less easily crashable type, as the big biplanes of the period were too elaborate for them to maintain. Harold Barnwell renovated his old 90 degree V-twin engine and built a kind of "parasol" monoplane. Frank Barnwell produced simultaneously a smaller edition of the machine with a 10-12 h.p. Jap motor-cycle engine. Neither of the machines did much good—Harold Barnwell's machine taxied fiercely about the ground, but the other little machine, according to her designer's account, "only chewed herself up when we managed to start the engine and ended ingloriously without leaving the shed."

At the beginning of 1910 Mr. Frank Barnwell returned to shipbuilding work with the Fairfield Company, but later joined the Bristol Company with the excellent results known to all. Mr. Harold Barnwell continued his work alone and produced what at this date appears to have been an extraordinary good effort at design. The machine was a little tractor monoplane of very clean lines and fitted with a two cylinder horizontally opposed water-cooled engine.

On this he did quite an amount of short distance flying and incidentally won a prize for the first Scottish-built machine to fly over a mile. After his second and fairly comprehensive smash on this machine, caused by stalling it in the effort to avoid some telegraphic wires, Mr. Harold Barnwell determined to come south to learn to fly before building anything more himself. It seems well to recall this machine because it flew really well and was considerably in front of its time. Undoubtedly a modern pilot could give quite a good show on a similar machine. Harold Barnwell's subsequent work was all done in the south, as was related in the recent memoir in this paper.

INSPECTORS' EXPENSES.

One gathers that at times certain R.N.V.R. officers employed on inspection duty, not only under Royal Naval Air Service, but in other branches of production, experience difficulty in obtaining prompt settlement of travelling expenses. The R.N.V.R. officer is not highly paid, and, consequently, unless he happens to have a handsome private income, he is rather apt to find himself in somewhat straitened circumstances if he is compelled to lay out money on travelling, and has to wait before his expenses are paid.

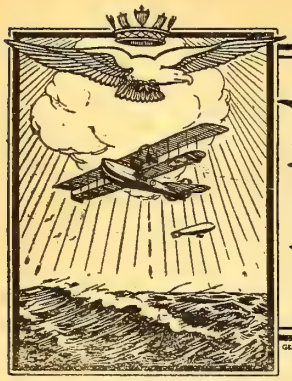
Officers who find themselves in such a predicament will do well to remember that Article 1508 of the King's Regulations lays down that officers whose duties necessitate frequent journeys are entitled to obtain advances to meet their anticipated expenses. Claims for expenditures are rendered monthly, and when these claims are sent in officers are entitled to a further advance if required.

Owing to the growth of the various Services, naturally the regular Service accountancy staff is considerably overworked, and delays must occur on occasion, but so long as the original advance is adequate, officers need not necessarily be out of pocket at all. One understands that if necessary an officer may make arrangements to retain a small standing advance in order that he may always have money in hand. It is hoped that this information may be of use to those who have hitherto been ignorant of the fact that they are entitled to an advance.

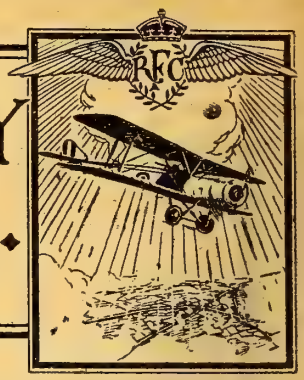
OUR FATHER.

The Navy is our Father (in the strictly legal sense
That binds an obligation just of shillings, pounds, and pence)'
A parent so neglectful of us children of the Air
That had not Hope maintained us we'd have died of sheer despair.
For Father didn't want us, and he didn't want to know
Just what it was we wanted, or the why or wherefore, so,
When lurid lights of warfare first came flashing through the sky,
Our Father quite forgot us and the fact that we could fly,
Till someone chanced to tell him, in a non-committal way,
That if he cared to notice there was Purpose in our Play.
So Father grew uneasy, for he found he had to own
That he was going reaping where he knew he hadn't sown;
So then he turned and mocked us, to his everlasting shame,
And even took exception to the fact we bore his name.
But, while he fumed and fretted in the grandeur of his mists,
Wherever there was fighting we were entered in the lists,
And we have wrought our purpose so to "seek out and destroy"
The forces of our foemen and of those in his employ.
And now we're feeling restless, for we feel that we could—well
Such funny things do happen that it's very hard to tell.

R.N.A.S.



NAVAL and MILITARY AERONAUTICS



FROM THE "LONDON GAZETTE."

Admiralty, Sept. 13th.

R.N.A.S.—Flt. Sub-Lt. to be Flt. Lt.:—M. McMaster, Aug. 15th.

War Office, Sept. 17th.

The King has been pleased to confer the Military Cross on the following Officers in recognition of their gallantry and devotion to duty in the field:—

Lt. (temp. Capt.) Roderick Leopold Keller, R. War. R., Spec. Res. and R.F.C.

For conspicuous gallantry and devotion to duty in attacking hostile aircraft, destroying one, and driving down others out of control. His dash and offensive spirit on all occasions have been splendid.

Temp. Sec. Lt. Edward Mannock, R.E. and R.F.C.

In the course of many combats he has driven off a large number of enemy machines, and has forced down three balloons, showing a very fine offensive spirit and great fearlessness in attacking the enemy at close range and low altitudes under heavy fire from the ground.

Sec. Lt. Andrew Edward McKeever, R.F.C., Spec. Res.

For conspicuous gallantry and devotion to duty, particularly when on offensive patrol. He attacked eight enemy aircraft single-handed at close range, and by his splendid dash and determination destroyed one and drove five down completely out of control. He had previously shown exceptional fearlessness in attacking the enemy when in superior numbers, and in the space of three weeks he destroyed eight hostile machines, setting a very fine example to his squadron.

Temp. Lt. (temp. Capt.) John Theobald Milne, Gen. List and R.F.C.

Whilst leading offensive patrols, he has shown great determination and courage in attacking hostile formations, although in superior numbers, at close range. He has also done long and arduous reconnaissances and secured good photographs under very adverse conditions and heavy fire, displaying throughout an admirable spirit of fearlessness and energy.

Sec. Lt. (temp. Capt.) Richard Raymond-Barker, Gen. List and R.F.C.

For conspicuous gallantry and devotion to duty when leading a fighting patrol. He attacked a large hostile formation, destroying two of them. He has also done excellent work in leading distant photographic reconnaissances, notably upon two occasions when his skilful leadership enabled photographs to be taken of all the required hostile area in spite of repeated attacks from enemy aircraft. He has helped to destroy seven hostile machines, and has at all times displayed conspicuous skill and gallantry.

Sec. Lt. Archibald Charles Reeves, R.F.C., Spec. Res

For conspicuous gallantry and devotion to duty in artillery observation, contact patrols and reconnaissance. He has continually done very daring and excellent work at low altitudes with a fine disregard of hostile fire and adverse weather conditions, and he has contributed information of the greatest value by his enterprise and fearlessness on all occasions.

Sec. Lt. Cecil Roy Richards, R.F.C., Spec. Res.

For conspicuous gallantry and devotion to duty when on offensive patrols in attacking and shooting down hostile machines. On one occasion he shot down four in one day, displaying great dash and a fine offensive spirit.

Temp. Sec. Lt. (temp. Lt.) Alexander Roulstone, Gen. List and R.F.C.

For conspicuous gallantry and devotion to duty when engaged in aerial fighting and in photographic reconnaissances. In spite of continual hostile attacks he has proved most successful in securing photographs, and on several occasions he shot down enemy machines out of control, displaying skilful manœuvring and great determination.

Temp. Capt. Henry Philip Rushforth, Gen. List and R.F.C.

For conspicuous gallantry and devotion to duty in leading bombing raids, the majority of which have been on distant objectives. Notably on one occasion he led a most successful raid under extremely adverse weather conditions, in spite of which the objective was reached and bombed from a low altitude, after which the whole formation of eight machines returned in safety, after a total flight of over five hours. The success of the operation was due to his determination and fine leadership.

Temp. Sec. Lt. (temp. Lt.) Owen John Frederick Scholte, Gen. List and R.F.C.

For conspicuous gallantry and devotion to duty on many occasions whilst carrying out reconnaissances and especially whilst protecting machines returning from patrols. He has continually distinguished himself by discovering hostile aircraft whilst observing from high altitude, and attacking them with great determination and success at close range. His vigilance, combined with his fine offensive spirit, have many times proved invaluable in frustrating hostile reconnaissances and driving their machines down out of control.

Temp. Sec. Lt. Charles Douglas Smart, Gen. List and R.F.C.

For conspicuous gallantry and devotion to duty when acting as pilot to another officer. They faced a violent thunderstorm, accompanied by a gale of wind and blinding rain, which had compelled all other machines to return to their aerodromes or to make forced landings, in order to locate the position of our infantry in the front line. This they successfully did, having spent one and a half hour in the air under fearful conditions, and returned with an accurate and valuable report to Headquarters.

Sec. Lt. (temp. Capt.) Donald Fasken Stevenson, Yeo. and R.F.C.

For conspicuous gallantry and devotion to duty in carrying out three contact patrols in one day in bad weather, and at low altitudes. Although attacked by enemy machines in superior numbers, he drove them off, and by his fine reconnaissance work brought back valuable information. He has at all times displayed indomitable pluck and initiative.

Lt. Oliver Stewart, Midd'x R. and R.F.C.

For conspicuous gallantry and devotion to duty. He has done consistent good work for six months, both on escorts and offensive patrols, and has displayed great fearlessness and skill during severe fighting at close range with enemy machines, successfully holding his own, although on several occasions outnumbered by them.

Temp. Sec. Lt. Richard Michael Trevethan, Gen. List and R.F.C.

When on offensive patrols he has continuously displayed the greatest dash and determination in attacking enemy formations, regardless of their superiority in numbers, and has shot down at least four, driving others down out of control.

Temp. Capt. Ernest Leslie Williams, Gen. List and R.F.C.

For conspicuous gallantry and devotion to duty in co-operating with our artillery, often under extremely unfavourable weather conditions. On one occasion in particular, although very much hampered by mist and clouds, he ranged three of our batteries onto a hostile battery position and enabled them to demolish it. His splendid example has been of the greatest value to his squadron.

Sec. Lt. Walter Bertram Wood, Hamp. R. and R.F.C.

For conspicuous gallantry and devotion to duty on many occasions, when engaged with hostile aircraft, during which he has shown a fine offensive spirit and the utmost fearlessness. He has had no less than 23 combats, in the course of which he has destroyed and driven down numerous enemy machines, frequently attacking several single-handed, and on one occasion fighting with his revolver when he had run short of gun ammunition.

CANADIAN FORCE.

Lt. Richard Duncan, Mtd. Rif. and R.F.C.

For conspicuous gallantry and devotion to duty in carrying out the duties of artillery pilot. When a hostile attack was imminent he carried out a reconnaissance at a very low altitude which enabled him to observe and report upon the position of the enemy infantry well behind their front line. He also accurately located their artillery, although his machine was much damaged by fire from the ground. He displayed splendid fearlessness and determination.

* * *

The King has been pleased to award the Military Medal for bravery in the Field to the following Men :—

6642 1st Cl. Air Mech. F. J. W. Adams, R.F.C. (Blackheath, S.E.).

7773 1st Cl. Air Mech. H. R. Deane, R.F.C. (Marylebone).

64246 1st Cl. Air Mech. H. V. Rowlatt, R.F.C. (Peterborough).

WAR OFFICE, Sept. 18th.

REGULAR FORCES.—STAFF.—GENERAL STAFF.—G.S.O., 1st Grade.—Maj. (temp. Lt.-Col. R.A.F.) J. C. G. A. Hankey, Res. of Officers, and to retain his temp. rank whilst so empld., Aug. 2nd, 1917.

TEMP. APPTS. AT THE WAR OFFICE.—Dep. Asst. Dirs.—July 20th, 1917: Temp. Lt.-Col. A. C. Macdonald, D.S.O., R.E.; temp. Capt. G. Waddell, Gen. List, from a Staff Capt.; temp. Capt. F. D. Outram, Gen. List, from a Staff Capt., Aug. 16th, 1917.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Sqdn. Comdr.—Lt. (temp. Capt.) A. C. Wright, Spec. Res., from a Flt. Comdr., and to be temp. Maj. whilst so empld., Aug. 27th.

Spec. Appt. (Graded as a Park Comdr.).—Temp. Capt. T. E. Gilmour, Gen. List, from Examining Officer (graded as an Equipment Officer, 1st Cl. at a School of Mil. Aeronautics), and to be temp. Maj. whilst so empld., Aug. 7th.

WAR OFFICE, Sept. 19th.

REGULAR FORCES.—The following Wt. to be Sec. Lt. for service in the field :—

R.F.C.—MIL. WING.—Actg. Sgt.-Maj. E. Maynell, July 22nd.

Men to be temp. Sec. Lts. :—

R.F.C.—MIL. WING.—Spr. J. V. Southon, from R.E., June 30th. 1st Cl. Air Mech. J. J. Williamson, July 27th.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Flt. Comdrs.—From Flying Officers, and to be tempt. Capts. whilst so empld. :—Temp. Lt. C. A. Brewster-Joske, Gen. List, June 18th. Lt. D. S. Hall, A. and S. Highrs., T.F.; temp. Sec. Lt. L. V. Thorowgood, Gen. List, Aug. 31st. Temp. Lt. W. A. Wright, Gen. List; temp. Sec. Lt. N. MacMillan, Gen. List, Sept. 1st; temp. Sec. Lt. F. H. Bickerton, Gen. List, Sept. 3rd. Lt. C. T. Lally, Spec. Res., temp. Sec. Lt. M. A. Hancock, M.G. Corps, Sept. 4th.

Adjt.—Lt. (temp. Capt.) T. M. Eggar, Co. of Lond. R., T.F., from a Staff Officer, 2nd Cl. (graded as a Brig.-Maj.), and to retain his temp. rank (without pay or allowances). Sept. 4th.

SCHOOL OF INSTN.—SCHOOL OF MIL. AERONAUTICS.—Comdts.—(Graded as Wing Comdrs.). From Comdt., Staff Officers, 1st Cl., graded as A.A.Gs., and to retain their temp. rank whilst so empld. :—Maj. (temp. Lt.-Col.) I. M. Bonham-Carter, North'd Fus.; Maj. (temp. Lt.-Col.) B. R. W. Beor, R.A., July 6th. Capt. (temp. Maj.) Lord A. R. Innes-Ker, D.S.O., Household Cav., from a Sqdn. Comdr., and to be temp. Lt.-Col. whilst so empld., Aug. 19th.

Asst Comdts.—(Graded as Park Comdrs.).—From Asst. Comdts., Staff Officers, 2nd Cl. (graded as Brig.-Maj.) :—Temp. Capt. F. A. Forde, Gen. List, and to be temp. Maj., from July 6th to 19th. Capt. C. S. McNab, Camn. Highrs., and to be temp. Maj. whilst so empld., July 6th. Maj. P. E. L. Elgee, R. Berks R., vice temp. Maj. F. A. Forde, Gen. List, July 19th.

Chief Instr.—(Graded as a Sqdn. Comdr.).—Maj. G. B. Stopford, R.A., from a Sqdn. Comdr., Aug. 19th.

Instr.—Graded as a Flt. Comdr.—Sec. Lt. (temp. Capt.) W. C. Campbell, M.C., Spec. Res., from a Flt. Comdr., Aug. 19th.

WAR OFFICE, Sept 20th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Staff Officer, 2nd Cl.—(Graded as a Brig.-Maj.) :—Lt. (temp. Capt.) W. O. Raikes, E. Kent R., Spec. Res., from an Adjt., vice Lt. (temp. Capt.) T. M. Eggar, Lond. R., T.F., and to retain his temp. rank whilst so empld., Sept. 4th.

Dir. of Aviation.—Maj. (temp. Lt.-Col.) G. M. Griffith, R.A., from an Asst. Dir. of Aeronautics, and to be temp. Col. whilst so empld., Sept. 1st.

Flt. Comdrs.—From Flying Officers :—Lt. (temp. Capt.) W. H. Williams, Lan. Fus., T.F., June 24th. And to be temp. Capts. whilst so empld. :—Sec. Lt. L. S. M. Page, Yeo., T.F., July 15th. Sec. Lt. (temp. Lt.) T. Henderson, R.E., T.F., Sept. 1st. Capt. W. Smyth, Lond. R., T.F., from a Flying Officer, Sept. 4th. From Flying Officers, and to be temp. Capts. whilst so empld. :—Sec. Lt. J. M. Allport, Spec. Res.; Sec. Lt. (temp. Lt.) W. E. Kemp, R. Lanc. R., Spec. Res., Sept. 5th.

Equipment Officers, 1st Cl.—Lt. F. C. Buck, Spec. Res., from the 3rd Cl., and to be temp. Capt. whilst so empld., Sept. 1st.

SCHOOLS OF INSTRUCTION.—SCHOOL OF MIL. AERONAUTICS.—Instr.—(Graded as an Equipment Officer, 1st Cl.) :—Temp. Lt. F. de B. Collenette, Gen. List, from an Asst. Instr. (graded as an Equipment Officer, 2nd Cl.), and to be temp. Capt. whilst so empld., Aug. 31st.

Gen. List.—To be temp. Sec. Lts. :—Sgt. D. M. Rawcliffe, from R.F.C., Sept. 3rd. Sgt.-Maj. H. M. Piper, from R.F.C., Sept. 8th.

ADMIRALTY, Sept. 21st.

A dispatch has been received from Vice-Admiral Sir Rosslyn E. Wemyss, K.C.B., C.M.G., M.V.O., late Commander-in-Chief, East Indies Station, covering a report by Captain Wilfrid Nunn, C.M.G., D.S.O., R.N., on the operations of H.M. Gunboats in Mesopotamia from December, 1916, to March, 1917, which makes the following reference to the work of aircraft :—

Operations on the Tigris during the months of December, 1916, and January, February, and March, 1917, which led to the capture and occupation of Bagdad by our forces on March 11th, 1917.

The gunboats at the Tigris front have co-operated with the Army in many intermittent bombardments of the enemy positions, and some very good results have been obtained, besides frequently engaging enemy aircraft.

We have at all times received great help from the Army, the Artillery Officers and Staff being indefatigable in rendering the Navy every assistance.

The 14th Kite Balloon Section, R.N.A.S., commanded by Commander Francis R. Wrottesley, R.N., marked for us on many occasions, besides the useful work it has done keeping look-out for the Army.

Aeroplanes have also been frequently put at the disposal of the Royal Navy for spotting.

WAR OFFICE, Sept. 21st.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Special Appt.—(Graded as an Equipment Officer, 2nd Cl.)—The unit of Sec. Lt. A. G. Saxty is Som. L.I., T.F., and not as in the "Gazette" of Aug. 25th.

WAR OFFICE, Sept. 22nd.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Sqdn. Comdr.—Temp. Lt. (temp. Capt.) J. C. Russell, R.E., from a Flt. Comdr., and to be temp. Maj. while so empld., Sept. 11th.

Flt. Comdrs.—From Flying Officers :—Sec. Lt. (temp. Lt.) E. G. E. Donaldson, R.F.A., Spec. Res., and to be temp. Capt. while so empld., Sept. 8th. Capt. F. H. Lawrence, Worc. R., Spec. Res., Sept. 9th. Lt. R. M. Charley, Spec. Res., and to be temp. Capt. while so empld., Sept. 11th.

Special Appt.—Graded as an Equipment Officer, 2nd Cl.—Temp. Sec. Lt. A. W. Smith, Gen. List, from an Equipment Officer, 3rd Cl., and to be temp. Lt. while so empld., Aug. 1st. (Substituted for the notification in the "Gazette" of Aug. 24th.)

Equipment Officers, 1st Cl.—Temp. Capt. W. A. W. Hallam, Gen. List, from a Staff Capt. at the War Office, Aug. 27th. 2nd Cl.—From the 3rd Cl., and to be temp. Lts. while so empld. :—Sec. Lts. H. R. Brutey and A. W. Grigsby, Spec. Res., Aug. 6th. Temp. Lt. R. Cadman, Gen. List, from the 3rd Cl., Aug. 7th. Temp. Lt. M. L. Horn, Gen. List, from the 3rd Cl., Sept. 14th. 3rd Cl.—Temp. Sec. Lt. (on prob.) J. H. Lowry, Gen. List, and to be confirmed in his rank, Feb. 8th. Sec. Lt. (on prob.) C. B. Charlewood, Spec. Res., April 22nd.

SCHOOLS OF INSTN.—SCHOOL OF MIL. AERONAUTICS.—Comdt.—Graded as a Sqdn. Comdr.—Maj. B. F. Vernon-Harcourt, Welsh R., a Sqdn. Comdr., June 15th.

Chief Instr.—Graded as a Sqdn. Comdr.—Lt. (temp. Capt.) H. F. Fisher, Spec. Res., a Flt. Comdr., and to be temp. Maj. while so empld., May 26th.

Instrs.—Graded as a Flt. Comdr.—Sec. Lt. (temp. Lt.) L. M. Woodhouse, Yeo., T.F., a Flying Officer, and to be temp. Capt. while so empld., Sept. 16th. Graded as an Equipment Officer, 1st Cl.—Temp. Lt. R. Rainford, Gen. List, from an Asst. Instr. (graded as an Equipment Officer, 2nd Cl.), and to be temp. Capt. while so empld., July 6th.

Gen. List.—Flt. Sgt. J. A. Sparks, from R.F.C., to be temp. Sec. Lt., Sept. 8th.

OVERSEAS CONTINGENTS.—CANADA.—R.F.C. AND P.P.C.L.I.—Temp. Maj. A. D. Carter is secd. for duty with the R.F.C., Aug. 14th.

CAN. INF. BNS.—Temp. Capt. R. W. Bell is secd. for duty with the R.F.C., Aug. 16th.

WAR OFFICE, Sept. 24th.

REGULAR FORCES.—STAFF.—ATTD. TO HDQR. UNITS.—Brig.-Majs.—Temp. Capt. A. Murray, Gen. List, vice Lt. A. McR. Moffatt, Arg. and Suth'd. Highrs., Aug. 18th.

Staff Capts.—Lt. H. French, W. York. R., Spec. Res., from Adjt., R.F.C., and to be temp. Capt. whilst so empld., vice temp. Capt. A. Murray, Gen. List, Aug. 18th.

R.F.C.—MIL. WING.—Wing Comdrs.—From Sqdn. Comdrs., and to be temp. Lt.-Cols. while so empld. :—Capt. (temp. Maj.)

T. A. E. Cairnes, D.S.O., D. Gds., Sept. 8th. Capt. (temp. Maj.) A. Ross-Hume, Sco. Rif., Sept. 22nd.

Adjts.—Lt. F. A. M. Rawes, R.A., Spec. Res., vice Lt. M. Nicholson, R.F.A., T.F., July 9th. Temp. Sec. Lt. R. C. Wansbrough, S. Staffs R., and to be temp. Capt. (with pay and allowances as Lt.) while so empld., vice Lt. H. French, W. Yorks R., Spec. Res., Aug. 18th. Capt. A. M. Wilson, Gord. Highrs., T.F., from a Flying Officer, Sept. 3rd. Sec. Lt. J. T. Pym, E. Surr. R., Spec. Res., to be temp. Capt. (with pay and allowances as Lt.) while so empld., and to be secd., Sept. 11th.

School of Instn.—Schools of Mil. Aeronautics.—Asst. Instr.—Graded as an Equipment Officer, 2nd Cl.—Temp. Sec. Lt. C. W. Duffield, Gen. List, a Flying Officer (Observer), and to be temp. Lt. while so empld., vice Lt. E. W. Vaughan, Spec. Res., Sept. 8th.

Memoranda.—Qrmrs. and Hon. Lts. to be Hon. Capts. (July 1st, unless otherwise stated):—W. J. D. Pryce (temp. Maj.), R.F.C.; T. Lyons (temp. Capt.), R.F.C., Aug. 12th. A. Fletcher, M.C. (temp. Lt.-Col.), R.F.C., Aug. 30th.

* * *

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign. The King has given unrestricted permission in all cases to wear the Decorations and Medals in question :—

Conferred by the King of the Belgians.

Ordre de Leopold.

Commandeur.

Maj.-Gen. H. M. Trenchard, C.B., D.S.O.

Chevalier.

Temp. Capt. N. A. Bolton, Spec. List and R.F.C.
Lt. (temp. Capt.) C. M. B. Chapman, M.C., E. Kent. R. and R.F.C.
Sec. Lt. (temp. Capt.) J. M. Child, Manch. R. and R.F.C.
Lt. (temp. Capt.) J. C. Russell, R.E. and R.F.C.
Sec. Lt. (temp. Capt.) J. C. Slessor, M.C., Spec. Res.

Ordre de la Couronne

Officier.

Lt. (temp. Maj.) J. E. A. Baldwin, Hrs. and R.F.C.
Sec. Lt. (temp. Maj.) L. A. Tilney, Household Cav. and R.F.C.

Chevalier.

Temp. Sec. Lt. S. Cockerell, Gen. List and R.F.C.
Temp. Sec. Lt. J. H. O. Jones, Spec. List and R.F.C.
Sec. Lt. (temp. Lt.) F. Tymms, M.C., S. Lanc. R. and R.F.C.
Temp. Lt. W. A. Wright, Gen. List and R.F.C.

Decoration Militaire.

22025 Sgt. R. O. Campbell, R.F.C. (Canada).
65088 Sgt. F. Reeday, R.F.C. (Stockport).
7420 1st Cl. Air Mech. C. M. Reynolds, R.F.C. (Birkenhead).
78780 Cpl. E. H. Rich, R.F.C. (Lea Bridge, E.).
12267 2nd Cl. Air Mech. F. N. Taylor, R.F.C. (Slough).
79087 2nd Cl. Air Mech. A. Tibbles, R.F.C. (Kentish Town, N.W.).

Ordre de Leopold.

Chevalier.

Capt. (temp. Lt.-Col.) R. R. Smith-Barry, Flying School.
Capt. (temp. Maj.) the Hon. L. J. E. Twisleton-Wykeham-Fiennes, Oxf. and Bucks L.I. and R.F.C.

Ordre de la Couronne.

Grand Officier.

Lt.-Gen. Sir D. Henderson, K.C.B., D.S.O. Director-General of Mil. Aeronautics.

Officier.

Maj. (temp. Lt.-Col.) C. F. de S. Murphy, D.S.O., M.C., R. Berks R. and R.F.C.

FROM THE COURT CIRCULAR.

Royal Train, Kirklee, Glasgow, Sept. 19th.

The King afterwards visited the Mossend Works of Messrs. William Beardmore & Co. (Limited), and was received by Sir William Beardmore, Bt. (chairman of the company), who presented the general manager and the works manager to His Majesty.

The King then proceeded by motor-car to the works of Messrs. G. and J. Weir (Ltd.), and was there received by the managing director of the company.

NAVAL.

The following promotions and appointments have been made in the Royal Naval Air Service :—

Sept. 19th.—Lt. (temp.).—S. R. Lowcock, promoted to Lt.-Comdr. (temp.), seny. Sept. 17th.

Mr. C. F. Ganard, granted a temp. commission as Lt. (R.N.V.R.), seny. Sept. 18th.

Sept. 22nd.—Temp. commns. (R.N.V.R.) have been granted, seny. as stated :—Lts.—S. Brew, Sept. 17th; and N. F. Bayliss, Sept. 21st.

Sept. 24th.—Temp. Sub-Lieut. G. S. Boston, promoted to temp. lieut., R.N.V.R., with seniority Sept. 21st

Temp. Flt. Sub-Lieut. E. McD. Wright promoted to Flt. Lieut., with seniority Sept. 21st.

The following decorations conferred on British naval officers and others by the Emperor of Japan were presented at the Admiralty on Sept 21st.

Second Class of the Rising Sun.

Rear-Admiral Charles Lionel Vaughan-Lee.

Third Class of the Rising Sun.

Commodore Murray Fraser Sueter, C.B.

Admiralty Communiqués.

Sept. 23rd.—On the night of the 21st our naval aircraft carried out bombing raids on Thourout and Cortemarck railway stations (eight and ten miles respectively behind the German lines in Flanders).

Thourout Station and lines were hit and a fire resulted. At Cortemarck the station buildings were hit and set on fire.

Bombs were dropped on the docks at Ostend on Saturday.

All our machines returned safely.

During the night of the 20th and morning of the 21st bombing raids were carried out by naval aircraft on the following military objectives: Aertrycke, Sparappelhoek, and Thourout aerodromes, and Thourout railway station. Bombs were also dropped near the Atelier de la Marine (naval workshops), Ostend.

A large quantity of bombs were dropped with good results.

Bombers were attacked by numerous enemy aircraft, which were driven off with the assistance of a Royal Flying Corps patrol.

All our machines returned safely.

Naval works at Ostend were on the 22nd bombarded by the ships of our Belgian coast patrol with satisfactory results.

Three seaplanes, attempting to assist the enemy by observation, were shot down by our air patrol.

The Casualty List.

Reported Sept. 19th.

Killed.—Vernon, Actg. Sqdn. Comdr. T. C., R.N.
Accidentally Killed.—Candey, Mr. H. W., Warrant Telegraphist, R.N.R.

Reported Sept. 20th.

Died of Wounds.—Cain, G., Snr. Res. Attdnt. (R.N.A.S.B.R.), M.15061 Ch.
Gilbert, G., Snr. Res. Attdnt. (R.N.A.S.B.R.), M.9645 Ch.

Reported Sept. 21st.

Drowned.—Dodd, Mr. R., Warrant Officer, R.N.A.S.
Accidentally Injured.—Sturman, Flt. Sub-Lt. E., R.N.
Previously reported Missing (feared lost), now officially reported Prisoners.—Robinson, Flt. Lt. W. E., R.N.
Jenks, Obsr. Sub-Lt. J. C. A., R.N.

Reported Sept. 22nd.

Killed.—Wright, Flt. Sub-Lt. N. S., R.N.
Seriously Injured.—Botterell, Flt Sub-Lt. H. J. L., R.N.

Reported Sept. 24th.

Missing.—Winn, Flt. Sub-Lt. J. H., R.N.
Broughall, Flt. Sub-Lt. H. S., M.C., R.N.
Desbarats, Flt. Sub-Lt. E. W., R.N.
McMillan, Flt. Sub-Lt. R. E., R.N.
Grace, Flt. Sub-Lt. E. V. J., R.N.
Wounded.—Anthony, Flt. Sub-Lt. E., R.N.
Sykes, Flt. Sub-Lt. R., R.N.
Ash, Flt. Sub-Lt. C. F. D., R.N.
Playford, Flt. Sub-Lt. N. P., R.N.

PERSONAL NOTICES.

Deaths.

BETTINGTON.—Squadron Commander A. F. Bettington, R.N., whose death was recorded last week, was 22 years of age. At the outbreak of war he left Cambridge and went to the Central Flying School, where he soon qualified for his certificate and proved a highly skilful pilot. From there he was posted to an R.N.A.S. station in Kent.

While there, on one occasion, he ascended after midnight in pursuit of one of the earliest Zeppelins that came to England. His mount on that occasion was an ordinary 80 h.p. Avro, and on this he chased the Zeppelin across the Channel, but lost it in a mist over the Belgian coast. Whereupon he returned to England, thus making a flight of 2¾ hours in the dark—quite an extraordinary performance for the period.

Thereafter, he went to the Dardanelles and took part in most of the bomb raids carried out by the R.N.A.S. After many months of hard work he was invalided home, and at the time of his death was in command of a gunnery and observers' school. He had only recently been promoted to Squadron Commander. The cause of his death is inexplicable, as the machine which he was flying dived from 5,000 ft. straight into the ground.

On several occasions when enemy machines have visited this country he did extremely good work, and was most anxious to go on active service again. However, he could not be spared from the school, where, as his Commanding Officer wrote, "His magnificent flying was a very useful object lesson to young officers who were learning to become pilots." His C.O. also wrote: "I feel that apart from having lost a most capable officer, I have

lost a personal friend, and I am sure that his death was a great blow to a very large number of officers and men in the Air Service."

The relatives of Flt. Sub-Lieut. W. Houston Stewart, R.N.A.S., and also Sub-Lieut. C. L. Haines, R.N.V.R. (Observer), will be glad to receive any information concerning the fate of these officers who were both reported missing on May 26th.

Any information respecting either officer should be sent to Mr. A. W. Houston Stewart, 123, Abbey Road, Barrow-in-Furness, Lanc.

MILITARY.

G.H.Q. Communiqués.

Sept. 17th.—On the 18th inst. our aeroplanes continued to observe for our artillery, in spite of most unfavourable weather conditions. One hostile machine was driven down out of control. Two of our machines are missing.

Sept. 19th, 9.17 p.m.—In spite of low clouds and a very strong west wind, a considerable amount of artillery work was carried out by us yesterday with aeroplane observation.

Three hostile machines were driven down out of control in air fighting, but combats were few, owing to the small number of German machines in the air.

Three of our aeroplanes are missing.

Sept. 20th, 10.0 p.m.—During the morning the weather cleared, and our aeroplanes were able to take a more active part in the battle, indicating the position of our troops and reporting hostile concentration to our artillery. In this way a number of German counter-attacks were broken up, while others were repulsed by rifle and machine-gun fire of our infantry.

On the 19th inst. the enemy's aircraft took advantage of the exceptionally strong west wind to make repeated attacks upon our artillery machines, turning east at once when approached by our scouts.

Nevertheless, considerable artillery work was done with aeroplane observation, and many photographs were taken by us.

Parties of hostile troops and transport were engaged with machine-gun fire during the day, and over one-and-a-half tons of bombs were dropped on various targets. Another ton of bombs were dropped during the night on the enemy's billets and hutments, in spite of most unfavourable weather.

Six German machines were brought down in fighting and four were driven down out of control.

Seven of our aeroplanes are missing.

Sept. 21st, 9.34 p.m.—On the 20th inst. during the first two hours of our attack low clouds and a drizzling rain made flying almost impossible. However, our aeroplanes flew out at a low altitude and dropped bombs on a hostile aerodrome near Courtrai, besides firing at bodies of German infantry.

As soon as the weather had slightly improved, aerial activity became great. Contact was kept with our advancing troops, and both aeroplanes and balloons gave observations for our artillery. On several occasions the location of enemy troops preparing for a counter-attack was reported to our artillery, who successfully dealt with the situation.

While the attack was in progress our aeroplanes fired from their machine-guns over 28,000 rounds from heights ranging between 100 and 1,000 ft. at the German infantry in their trenches and shell-holes, at reinforcements coming up to the battle, at bodies of hostile troops on roads and working behind the lines, and at hostile batteries, machine-guns, and transport.

By day 68 bombs were dropped on Ledeghem railway station, 96 on two aerodromes north-east of Lille, and 103 on billets, hutments, and ammunition dumps in the battle area.

At night, in spite of most unfavourable weather, two tons of bombs were dropped on Ledeghem, Roulers, and Menin railway stations.

In the middle of the day German aircraft became very active, attempting to interfere with our artillery, bombing, and low-flying machines. In the evening, when the weather improved, they kept well east of the lines and were disinclined to fight.

Ten hostile machines were destroyed and six driven down out of control.

Ten of our aeroplanes are missing.

Sept. 22nd, 9.45 p.m.—On the 21st inst. the weather improved, causing great aerial activity. A great deal of successful work was done with the artillery, our aeroplanes and balloons ranging the guns onto hostile batteries, troops in trenches and shell-holes, and other fleeting targets. Our low-flying machines continued to harass the enemy's infantry and transport in both forward and back areas.

Bombing was also continued, and four tons of bombs were dropped by day on Roulers Railway Station, on an aerodrome and billets in the vicinity of Lille, on an aerodrome south-east of Cambrai, and on hutments in the battle area. At night a further six and a half tons of bombs were dropped on Roulers, Ledeghem, and Menin railway stations, and on masses of transport and troops on the Menin-Ypres road.

The enemy's troops and transport on this road were also effectively engaged with machine-gun fire, many thousand rounds being fired by our machines from a height of 400 ft.

Enemy aircraft was extremely active and aggressive until the afternoon. Activity then died down considerably, the enemy's machines keeping well east of the lines and refusing combat.

Ten German aeroplanes were brought down in fighting and eight others driven down out of control. Another enemy machine was brought down by our infantry on the 20th inst., in addition to those already reported for that day.

Twelve of our machines are missing, including two which have not returned from night bombing.

Sept. 23rd, 9.15 p.m.—On the 22nd inst. misty weather resulted in a decided decrease in the great aerial activity of the last few days.

Our aeroplanes, none the less, carried out successful bombing raids, and during the day dropped 134 bombs on hostile billets, hutments, and aerodromes. In the course of the night a further three tons of bombs were dropped on Roulers, Menin, and Wervicq railway stations.

The enemy dropped a few bombs at midday, doing little damage.

Four enemy aeroplanes were brought down in air fighting, and five were driven down out of control.

Two of our aeroplanes are missing.

Sept. 24th, 9.12 p.m.—On the 23rd inst. there was again a slight lull in aerial operations, though our aeroplanes and balloons continued to observe for our artillery.

Successful bombing raids were also undertaken, in the course of which aeroplanes dropped 167 bombs on hostile billets, hutments and aerodromes.

In air fighting eight enemy machines were brought down and six were driven down out of control. Another hostile machine was brought down by us on the 22nd inst., in addition to those already reported for that day.

Three of our machines are missing.

War Office Communiqué.

Sept. 23rd.—The G.O.C. the British Forces in Macedonia reports:—

During the week our aeroplanes have carried out successful local bombing raids on Puljovo, Kara Oglular (north-west of Doiran), and other places.

Home Command Communiqués.

Sept. 24th, 1.35 a.m.—Hostile airships appeared off the Lincolnshire and Yorkshire coasts early this morning.

The raid is still in progress, and details are not yet to hand.

11.55 p.m.—Hostile aeroplanes attacked the South-East Coast of England this evening.

The raiders came in at different places in Kent and Essex, and a few of them followed the River Thames and attacked London.

Bombs were dropped at several points, and so far the casualties reported amount to six killed and about 20 injured

Sept. 25th, 11.45 a.m.—Latest reports concerning last night's aeroplane raid show that the group of raiders which approached London was driven off by anti-aircraft gun-fire.

Only one, or at most two, machines penetrated the defences.

The casualties in all the raided districts reported by the police up to the present are:—

Killed, 15; injured, 70.

The material damage is not great.

Enemy airships crossed the Yorkshire and Lincolnshire coast between midnight and 3 a.m., but there is no evidence of their having penetrated to any distance inland.

They were driven off by gun-fire from various defended localities which they attempted to approach.

Bombs were dropped at one coast town, three women being slightly injured.

Little material damage was caused.

The Casualty List.

Reported Sept. 19th.

Killed.—Pilkington, Lt. J. O., R.F.C.

Died of Wounds.—Crosbie, Lt. J. C., R.G.A., attd. R.F.C.

Missing.—Quilter, Sec. Lt. E. G. C., R.F.C.

Reported Sept. 20th.

Wounded.—Barker, Capt. W. G., M.C., R.F.C.
Cann, Sec. Lt. L., R.F.C.
James, Sec. Lt. R. V., Durh. L.I., attd. R.F.C.
Topham, Sec. Lt. H. G., Suff. R., attd. R.F.C.
Wylie, Sec. Lt. A. L., M.C., R.F.A. attd. R.F.C.

Reported Sept. 21st.

Killed.—Bishop, Sec. Lt. B. B., D.C.L.I., attd. R.F.C.
Davidson, Lt. A. G., Gord. High., attd R.F.C.
Peacock, Lt. A. W., R. Scots, attd. R.F.C.

Previously reported Missing, now reported Killed.—
McPherson, Sec. Lt. L. A., R.F.C.
Platt, Capt. L. S., Lrs., attd. R.F.C.
Sayer, Sec. Lt. J. H., R.F.C.

(*Continued on page 910.*)

AERONAUTICAL ENGINEERING
SUPPLEMENT TO "THE AEROPLANE"
INCORPORATING AIRCRAFT ENGINEERING, AERODYNAMICS, AND MATTERS PERTAINING TO THE AERONAUTICAL ENGINEER AND THE AIRCRAFT TRADER

THE SOCIETY OF BRITISH AIRCRAFT CONSTRUCTORS.

The Second Annual General Meeting of the Society of British Aircraft Instructors was held on August 29th at Caxton Hall, S.W., when the Society's annual report and accounts were submitted.

The Chairman, Mr. H. White Smith, stated that before asking those present formally to adopt the report and accounts, he would like to take the opportunity of making a few remarks upon the general position of the Society.

He would point out that owing to the way in which the industry had grown, a representative trade organisation became much needed, and, as stated in the annual report, the co-ordination of the industry effected through the Society had, in the opinion of the Management Committee, unquestionably been of distinct national benefit.

Many problems arose from time to time in which an organised body was absolutely necessary, and no doubt there would be a large number of difficult problems to be tackled when Peace came, when it would be even more important to have a strong representative Society.

As regards the work done the Chairman said that he had been running through the minutes of the different meetings, and while it would take too long to detail all that had been undertaken, he would like to refer to a few matters. Before doing this, however, he wished to say that the Management Committee had adopted the policy of communicating immediately with members on all points that arose from time to time.

It was felt that that was the better course. It meant worrying members sometimes, but he thought it was better to err on the side of consulting members on matters affecting them.

One of the interesting events of the year was the arrangement entered into with the Aeronautical Society of Great Britain, referred to in the report. There was a Standing Joint Committee of the two Societies before whom matters of interest to the two bodies came. One very important matter which the Joint Committee had been considering was the question of the formation of a Research Association for the Aeronautical Industry, which subject was to be laid before the Council of the Society.

The Chairman, after referring to the steps which had been taken during the year in various matters of interest to the industry, stated that the Management Committee had various important matters in hand at the present moment, and he felt sure that the Society would be of increasing usefulness to its members as time went on.

A resolution adopting the report and accounts for 1916 was then passed, as also was a resolution to the effect that the present Council should remain in office until the next General Meeting.

The auditors, Messrs. G. A. Touche and Co., were re-elected.

Immediately following the General Meeting, a meeting of the Council of the Society was held, at which Mr. Hamilton Barnsley (Lanchester Motor Co., Ltd.), Mr. E. Allen (C. G. Spencer and Sons, Ltd.), and Captain R. L. Charteris (A.B.C. Motors, Ltd.) were added to the Council, and Mr. Stuart A. Hirst (Blackburn Aeroplane and Motor Co.) was elected to the Council in place of Mr. Robert Blackburn.

Mr. H. White Smith was unanimously re-elected Chairman of the Society.

Mr. R. O. Cary, Mr. L. Coatalen, Mr. J. D. Siddeley and Mr. Howard T. Wright, the four members of the Committee of Management, who had retired and offered themselves for re-election, were unanimously re-elected; and Sir Herbert Austin and Mr. F. Handley Page were elected to fill two places on the Committee left vacant by the resignation of Mr. H. V. Roe and Mr. B. Caillard.

Discussion then followed upon the proposed formation of a Research Association for the Aeronautical Industry. It was pointed out that the Government had set up a new Department—the Department of Scientific and Industrial Research—and had placed a fund of a million sterling at the disposal of that Department to enable it to encourage industries to undertake research.

Briefly, the scheme proposed by the Government is that special Research Associations shall be formed by manufacturers, and that a programme of Research shall be drawn up, the Department making a contribution towards the income raised by the Association for carrying out such programme. The Department would have to approve the Research programme, but it is laid down that the Research Associations are to be formed to carry out a programme of Research, and not for any particular item of Research.

The Government contribution would not be more than pound for pound, and the contribution would be promised for a period of years to be agreed upon, and not

exceeding five. Contributions by firms to a Research Association formed under conditions approved by the Department would be allowed as a deduction for income tax and excess profits duty purposes.

A draft Memorandum of Association for such Research Associations has been prepared by the Department of Scientific and Industrial Research. Put shortly, this Memorandum provides that the objects for which the Research Association is established are:

(a) To promote research and establish laboratories.
(b) To accept grants of Government money, etc.
(c) To employ technical advisers.
(d) To establish museums, libraries, etc.
(e) To investigate inventions, etc., for the purposes of the Industry.
(f) To co-operate with other Associations.

The position of the Aeronautical Industry in relation to this scheme for the development of Scientific and Industrial Research has been under careful consideration by the Standing Joint Committee of the S.B.A.C. and the Aeronautical Society, and conferences have been held with Sir Frank Heath, the secretary to the Government Department in question.

One of the conditions laid down by the Department of Scientific and Industrial Research is that the initial composition of the Board of Management of the Research Association must be approved by the Department. Subsequently, the nominations for Chairman of the Board and for one half of any vacancies that may occur on the Board have to be approved by the Department. The Board of the Association has to appoint a Director of Research or other responsible technical adviser, who could be entrusted with the general direction and supervision of the research work undertaken by the Association.

After discussion of various points involved, it was decided that a Research Association for the Aeronautical Industry should be formed.

On "Break" Clauses.

By "TAMEN."

Just as there are more ways of killing a cat than choking it with butter, so there are more ways of killing an industry than are dreamt of in the philosophy of Horatio or anyone else. Personally, I can imagine no more expeditious and certain way of committing industrial suicide than that offered to an aircraft manufacturer who is invited to sign the existing form of Government contract without modification.

One of the special beauties of what is called the "Break" Clause—presumably on account of its undoubted ability to break anyone who signs it—is the provision that the Government shall have power to terminate contracts at fourteen days' notice, subject to an undertaking to pay for material necessarily in stock or on order; provided that one of the contracting parties—obviously not the manufacturer—shall adjudicate for himself as to whether such materials ever ought to have been ordered or bought. It is suggested that these materials should be taken over at cost price, plus a quite inadequate allowance to cover establishment charges. There must be few, if any, industries to which the Clause providing fourteen days' notice would not be damaging and probably ruinous.

In the case of the aircraft industry, the shortness of the proposed notice is beyond all reasonable limits. To stop down, after fourteen days, work that has only been developed up to its present dimensions by the continuous labour of years, would mean to throw huge bodies of men out of employment, and to all intents and purposes, the destruction of an industry upon which

THE CRICKET TEAM OF THE INTEGRAL PROPELLER CO., LTD., Winners of the Championship of the 1st Division London Munitions Cricket League. Defeated by the W. and G. Team of No. 2 Division in the League Championship Match. On the right, Mrs. Latimer Voight (Joint Managing Director of the Integral Co.). Behind her, Mr. Saunders (Works Manager). On the left, sitting, Mr. E. Latimer Voigt (Joint Managing Director). Behind him, Mr. Stewart (Works Foreman).

the very existence of the British Empire has been shown to be dependent. It is obviously absurd to attempt to standardise the notice which ought to be given to various industries. What is adequate in some cases is totally inadequate in others.

There may be examples—though the writer confesses he is not familiar with them—in which fourteen days would be enough. There are others in which fourteen months would not be too much, and the aircraft industry undoubtedly comes very near the long end of the scale.

It would probably be fairly satisfactory if the "fourteen days" clause could be re-worded to read "eight months." Nothing below six months ought for a moment to be contemplated by anyone who knows the circumstances. In this connection, would it not be advisable to provide that the output corresponding to the agreed number of weeks or months, and estimated on the basis of the output actually produced during an equal number of preceding weeks or months, should not be actually due for delivery in the time prescribed, but should preferably be deliverable during some longer period?

For example, if six months' notice were considered reasonable, it might be better not to say that all contracts should be terminable on six months' notice being given, but rather to say that after notice of termination of contract is given, the manufacturer shall deliver to the Government within twelve or perhaps fifteen months a number of machines equivalent to the output of the past six months prior to the receipt of notice of termination.

If, with a view to the commercial demand that will spring up after the war, manufacturers wish to produce types in some ways dissimilar from those at present built, the change would be more easily effected if, during the period of change, the whole energies of the manufacturer were not obliged to be concentrated entirely and exactly on the war-time product.

As regards the other features of the "Break" Clause, the writer has not enough impertinence to attempt to criticise them in detail. Of a surety, criticism is needed, but it ought to come from manufacturers who alone can assess reasonable establishment charges and estimate the cost of handling, storage, and so on.

On one matter of underlying principle, even the outsider may perhaps be permitted to air his views. In referring to materials in stock or on order, the "Break" Clause perpetually reiterates the theory that the Government should only pay for such materials if the purchase or order is regarded by the Minister responsible as reasonable and proper in view of the output to be maintained.

Obviously, we have here a source of endless possible trouble. The contractor may be of the opinion that he cannot maintain his maximum output without providing, let us say, twelve months in advance. The Minister may be of the opinion that four months' supplies in stock or on order would have been amply adequate.

In the event of such a disagreement, the contractor, who had only involved himself in bigger commitments out of a desire to maintain a full output in the interests of the country, would be informed that two-thirds of his commitments had, in the opinion of the Minister, not been reasonably and properly incurred, and the material represented by this two-thirds would consequently be left upon his hands. Evidently, no prudent manufacturer could subscribe to a proposal of this sort, which gives one of the parties in a contract power to vary or construe that contract to suit his own ideas.

Concluding, then, that the Clause will not do as it stands, there appear to be two main alternatives between which to choose. One of these would be to secure a written statement in which the responsible Minister had defined exactly what was meant by the words "reasonable and proper" in the specific case under consideration. Investigation might show that manufacturers found it in their opinion impossible to maintain output without looking, say, nine months ahead. If that were so, the Clause would be rendered infinitely more satisfactory if a letter were obtained from the Minister stating that he would regard all the commitments in respect of material up to the equivalent of a nine-months' output as having been reasonably and properly incurred.

The other alternative, and probably the better one in the case of this particular industry, though not in all somewhat similar cases, would be an actual alteration in the wording of the Clause, providing that the decision should not be left to the Minister, but should be referred to outside arbitration. In the aircraft industry, the circumstances of various firms must differ immensely, and an actual definition would very likely be quite satisfactory to some and equally unsatisfactory to others.

If the second alternative were adopted, each case would be decided individually upon its merits, and the only objection appears to be the possibility that reference to an outside arbitrator might involve long delays in settlement and a good deal of acute disagreement in the meanwhile. Nevertheless, it is to be hoped that it will be found possible to adopt this method of improving the "Break" Clause.

Incidentally, it is indeed a subject for congratulation that the aircraft industry has organised itself to negotiate as one entity in matters of this kind. It would be difficult to find a better example to prove the great necessity for full co-operation among manufacturers. We have always in this country suffered from the fact that every Government department takes a detached point of view. Now that the number of departments has been multiplied, this trouble has become worse than ever.

The terms of a "Break" Clause in Government contracts ought really to be made subject to the consideration not only of the department that enters into the contract, but also of the department of the Government specifically charged with the duty of looking after the permanent interests of British industry.

A department which simply wants supplies views the manufacturer merely as a temporary convenience existing for the period during which the department's wants continue. It does not care in the least what happens to him afterwards, and thus it may, with the best of intentions in the way of reducing public expenditure, succeed in killing an industry which has been found absolutely essential in the future.

The jealousy which exists between Government departments is proverbial. If such jealousy had been eliminated, we should not have the Foreign Office and the Board of Trade quarrelling for a quarter of a century as to who should look after British commercial Oversea interests, and each only succeeding in preventing the other from proving effective.

Certainly, there ought to exist some one department charged with the duty of protecting manufacturers against other departments, and having sufficient powers to make its intervention effective. In the absence of any such protection of an official character, the manufacturer must—and fortunately does in our case—depend on applying the united influence and strength of the whole industry of which he is a unit.

"LURE OF HIGH WAGES."

[The following article from the Austin "Advocate" is worth the attention of all manufacturers.—Ed.]

This heading, suggestive of the latest cinema thrill, was used for a newspaper report of the action recently brought against the Company by the Ministry of Munitions for an alleged breach of the Defence of the Realm Regulations relating to the recruitment of labour. It is a misleading title, and, as it has been given a good deal of prominence, some refutation of its suggestiveness of unfair inducement is necessary. Its publishers apparently overlooked the existence of "the district rate of wages," apart from the fact that the men, in addition to home expenses, would have the cost of "diggings" to meet, with a *certain* increase in the cost of living as compared with the district from which they came. As a matter of fact, he would be little better off, if any, and it can be accepted that the men came more because of the pressing need of munitions and their wish to help, than for any "lure of high wages." No inflated wages were offered, but suitable pay for a good day's work.

The case was heard at St. Austell in the "delectable duchy" of Cornwall, and excited a good deal of interest, being the first case of its kind. The prosecution alleged that the Company had "aided and abetted in the inducement of persons residing at St. Austell at a distance of more than 10 miles from the factory, to accept employment therein, otherwise than by notifying vacancies to an Employment Exchange, contrary to the Defence of the Realm Act."

The Counsel appearing for the Public Prosecutor paid a high tribute to the Company, stating inter alia "that it made a great success of the work it undertook, and rendered most valuable service to the country, for which it had earned and received the thanks of the Ministry of Munitions."

The Defence argued that the labour obtained having been passed through the Employment Exchanges was the correct interpretation of the Regulations, and as that action had been taken, no offence was committed. However, the Public Prosecutor prevailed, and fines and costs amounting in all to £90 were inflicted.

That the Company should have been brought to account for obtaining labour which the Employment Exchanges were unable to provide for the production of essential munitions would appear to the uninitiated as an irregularity, and to Controlled firms as an application of the provisions of the Defence of the Realm Act, which its promoters did not have in mind when drafting the section upon which the charge was based: for the men recruited were clay miners engaged upon work which was not Controlled or of national importance, and were even working short time.

The Company did not concern itself with petty restrictions which were proved in the Court to be wanting in decision, as evidenced by the fact that a case was allowed to be stated. Its efforts were directed to obtain the labour, and the results showed up well in comparison with those of the Government department set up solely for that purpose.—The Editor.

The Production of Aeroplanes and their Components

(Fourteenth Instalment.)

BY STEPNEY BLAKENEY.

Engine Back-plates.

Having completed the flanging of the lightening holes the flanging of the edge of the plate may next be taken in hand.

A Warning.

Before proceeding further, I think it may be advisable to mention to readers of these articles that, in marking off steel plates, there is a certain danger in using a sharp pointed steel scriber, as I have known steel plates which, when marked off thus, have, on being bent or flanged, developed a distinct fracture along the scriber line, and fittings have had to be scrapped from this cause.

To prevent this arising I suggest that a hard brass scriber be used as much as possible, in place of a steel scriber. Centre-pop marks also frequently cause a tear in metal.

Flanging Out.

The marking off of the flange being completed, the flanging may be commenced. If a wooden mallet be used, then a cast-iron or mild steel block can be used as an anvil. If a steel hammer be used, then a hard wood block must be used. Few people seem to realise this.

Also, it is well to note that the quickest way to take twists, kinks, and dents out of sheet metal is to hammer it with a steel hammer on an end grain piece of wood. For some reason best known to themselves some people prefer to hammer a piece of metal furiously on an anvil, which generally ends in the metal being either reduced in gauge, or dented all over with hammer marks. Of course, these look nice, if done in an artistic pattern, but, fortunately, we have not yet arrived at that stage in the manufacture and decoration of aeroplanes. We may come to it after the war.

The Engine Hole.

After the flanges are completed and the corners welded and the whole plate has been tested for squareness and flatness and for its general truth, the centre hole for attaching the engine may be marked off and carefully cut out, and the attachment bolt hole carefully and accurately drilled. No "allowances" can be permitted at all, and dimensions must be worked to very minutely.

In fact, it may be deemed advisable to chuck the engine-plate in a lathe and bore out the hole finally to ensure its being accurate. In removing the greater portion of the centre of the hole it is advisable to drill a considerable number of holes, and cut out the centre by chiselling through the centre of these holes, if not bored out in the lathe.

The front engine-plate may be dealt with in the manner previously described, after which each one should be carefully annealed.

Attaching Engine-plates to Fuselage.

Before drilling the bolt holes in the fuselage for attaching the engine-plates, it is best to clamp the plates in position and test their position, and satisfy oneself that the plates are dead in the centre all ways. If this is not very carefully done, general trouble may be expected, especially in truing up the machine ready for flying, as it will be impossible to line the engine up true with the fuselage.

Petrol Tanks.

The manufacture of the petrol tank might now be considered, and, as this has to fit in between the longerons, it is necessary to work strictly to dimensions, or it may not fit in position.

The workmanship must be extra good, as it has to stand internal air pressure, and all joints, riveting and sweating with solder must be perfect, otherwise serious leaks may develop and cause fire to break out in the air with fatal results.

The material frequently used is tinned-steel sheets of best quality, about 22 to 24 gauge, riveted up with $\frac{1}{8}$-in. snap-headed copper rivets, and best tinman's solder.

The pitch of the rivets is about 1 in. apart. They must be in a dead straight line along the joints, and all rivets must be very carefully snapped, and all riveting must be concentric with the centre-line of the rivets, otherwise they are liable to rejection.

As it is generally a difficult matter to replace rivets, any divergence may mean a tank being scrapped, which is an expensive item to the contractor.

Tank Shells.

The first thing that can be started is the shell. This will be made of two sheets or one sheet, according to the size of the tank and sheets. The theoretical girth of the tank should be most carefully ascertained from the drawings and set out on the sheets together with sufficient margin for flanging and forming the joint at the bottom of the tank where the joint is usually placed.

There are various kinds of joints. The simplest, of course, being a lap joint, riveted, and sweated after riveting. The usual joint is a double-flanged joint, the flanges tightly locking each other, and sweated with solder each side of plate.

Side Panels.

The joint for the side panels is generally made in the following manner:—The side panels having been carefully cut out to the required dimensions, the edges are flanged with a $\frac{1}{2}$-in. flange. The side panel can then be placed inside the shell plates, the edge of the flange of the side panel, which will be outwards, being adjusted all round inside the shell so that the edge of its flange is about $\frac{1}{2}$-in. from the edge of the shell plate.

The side panels are soldered in position, and the flange of the outer shell flanged back over it. After this, the spacing and marking out of the rivet holes can be proceeded with. But before fixing in the side panels, or ends, there is a stiffening diaphragm to be put into the tank shell.

Riveting Ends.

Having marked out the rivet holes for the panels, the quickest way to drill these will be with a small electric portable drill, such as are made by the General Electric Company, this work being done on the tinsmith's bench. As soon as the drilling is complete, the rivets can be put in and carefully riveted over with a small ball-paned hammer, and finished up with a small semi-circular snap.

The riveting being complete, the next thing to do is to spread a neat film of solder over the rivets and into the joint. It must be clearly understood that a thin neat film of solder only is required, and not a thick mass of uneven lumps.

The Stiffening Diaphragm and Fittings.

The next thing to do is to fix the diaphragm plate to stiffen the shell.

Before proceeding, it may be as well to set out the position of any fittings or connections, which have to be attached to the tank by means of rivets, or other ways of attachment, as it will not be possible to do so when both the side panels are in position.

Having attached all fittings, the remaining side panel can be put in, riveted up, and soldered, and all rivet-heads lightly and neatly floated over the solder.

Remarks on Soldering.

With regard to soldering, what is actually required is to consider the soldering-iron a paint brush, and with it cause the solder to flow evenly and cleanly where required. I have met some people who imagine that the process of soldering consists of attaching as many isolated lumps to the work as possible.

If any remark is made about possible leaks owing to untidy rough soldering, they proudly tell you there is plenty of solder, which is just what is not wanted. Half the quantity evenly spread on clean metal with a well-heated iron, thoroughly cleaned, and with plenty of flux, does the job a heap better.

Testing Tanks.

Assuming that the tank is finished, it must now be tested for leaks. One of the recognised ways is to neatly fill it with paraffin, attach a pressure-gauge to it on one of the fittings or outlets, and then with a motor foot-pump, or large bicycle pump, fill the tank with 10 lbs. per square inch air-pressure. Close up all known outlets and leave the tank for 24 hours, then note the pressure in the tank, and look for leaks and make good.

Joining Pipes.

With regard to preparing copper pipes, etc., it occasionally happens that pipes have to be joined. Assuming that we have a $\frac{3}{8}$-in. by 20-gauge copper pipe to join, we can do this various ways, but no way must be adopted that reduces the bore at this particular point. Therefore, to overcome this difficulty, expand each end of the pipes to be joined for a length of $\frac{3}{4}$ in., then obtain a piece of the $\frac{3}{8}$-in. by 20-gauge copper pipe, carefully cut of $1\frac{1}{2}$ in., square the ends, and slightly taper them off, slide this piece into one of the expanded ends of copper pipe to be joined. This must be a slightly loose dropping fit. Then braze this liner in.

Having done this, clean off all superfluous spelter and insert this short length of pipe into the other expanded end of copper pipe, press tightly together, and clamp up. Then braze in a similar manner and clean off.

Another way of joining tubes is to expand one end only and insert the end of the other piece of tube into it and then braze. This makes a simple neat joint, but some people may not consider it quite so strong.

[Yet another way is to butt the two ends together and put an external sleeve over both. This does away with all flanging or expanding out, which is rather likely to weaken the tube by reducing the gauge.—Ed.]

Joining and Splicing Cable.

The splicing of steel wire cables for controls is work that can only be done by experienced men. It is simply absolute waste to experiment and to attempt to do this work if you are not trained to it. But other methods of attaching cables to shackles and eyelet bolts are frequently adopted for 5, 10, 15 and 20 cwt. cables in aeroplane and seaplane work.

Before cutting a wire cable, place the cable at the point to be cut into the flame of a blow-lamp, then bind with thin iron wire with two separate bindings, leaving a space between each binding of about ⅛ in., and cut with a sharp steel chisel.

Simple Joint.

To make the cable fast to an eyebolt or shackle, place the cable through the shackle, ring, or eyebolt. Bring about 6 in. through. Then bind this 6 in. to the side of the cable with 20-gauge copper wire for a length determined by the size of the cable, the bindings being about 1/16 in. apart. Then sweat with solder, and then cut off the ends not required. This method is frequently used, and is, if anything, slightly stronger than an ordinary spliced joint. This is not a surmise, but an actual practical fact, which has been proved.

Stretching Cable.

Before any cable is cut to the dead length required, it should be stretched up to its full load. This acts as a test of the strength of the cable, and prevents it from becoming slack after being placed in position in the aeroplane. Also, the stretching probably prevents one having to scrap the cable owing to its developing excessive length after being in use for a time.

(To be continued.)

HAVE WE GOT THE BEST ENGINES?

The following letter has been received:—

Sir,—It may be revealed after the war that better designed aero-engines than some of those at present in use have been turned down by the Air Board, and that engine designs which should have been pigeonholed have been ordered by the thousand. Ugly rumours are flying around, and many are curious to know how one particular engine found its way into an aeroplane, and what is its record up to date?

The method of dealing with designs sent in by practical engineers outside a given circle should be reformed. The official letter signed by a highly-paid official, who probably has no practical knowledge of the subject, is out of date. Let the men who pose as experts give a tangible reason for the nonacceptance of a design, and back their opinion and reputation with their signatures.

Many of our experts are out of date, living on a reputation made many years before the war. To combat the Huns' up-to-date scientific methods we should have a committee of disinterested men with up-to-date business methods, who can tackle the problems daily as they come in, and see that each designer gets a fair hearing without favours.

As things now stand it takes from six weeks to two months to get an official reply, which might have been sent by return of post, because they are all the same, meaningless and noncommittal, and still we marvel not at the cry, "too late."

(Signed) "Intheno."

Farnborough, Hants, Sept. 14th.

BOWDEN WIRE WORKERS AT PLAY.

The grounds of the Harlesden Cricket Club were the scene of the first annual sports (combined on this occasion with the entertainment of wounded soldiers) of the Bowden Wire Social and Athletic Club—an organisation of the workers of Bowden Wire, Ltd., London. The day was fine, the attendance large, and the whole affair enthusiastic and enjoyable—thanks in no small degree to the efforts of the managing director, Mr. J. R. Nisbet, and the firm's chief representative, Mr. Alec. Ross—both well known and experienced in the realms of sport.

In the 100 yards Scratch, a popular winner was Mitchell, a discharged soldier, who had worked very hard for some weeks past in training the tug of war teams. The quarter-mile Handicap was rather easily won by Holdsworth. The quarter-mile Obstacle race fell to Kemp, and the 100 yards Ladies' to Miss Byford. The most popular events were perhaps the two Tugs of War—one for men and one for women—arranged with the firm's neighbours, Messrs. Lyon and Wrench. Bowden Wire Ladies' team were the winners of their event, but the men's team succumbed rather easily to Messrs. Lyon and Wrench. The wounded soldiers, who were the guests of the afternoon, asked for a one-handed pull against a picked team, and enthusiasm ran high when they won after a good pull.

The third concert and tea, given by the Bowden employees to wounded soldiers, is fixed for September 22nd.

AIRCRAFT SUPPLIES CO.'S NEW PREMISES.

Another milestone in the history of the Aircraft Supplies Co., Ltd., is marked by the removal of their Head Offices and Stores to larger and more central premises at "Ascol House," 125, Long Acre, London, W.C.2.

Here, in addition to the General Offices of the Company and the extensive Stores—containing nearly 2,000 bins, comprising almost every conceivable standard aircraft part—will be opened the first show room, devoted entirely to aircraft parts and equipment, where actual parts may be examined, and from which supplies may be taken away without any delay whatever.

The fact that these premises are situated in the heart of the motor-car business shows considerable enterprise on the part of the Company, as at the present time there is hardly a motor-car firm which is not engaged on aircraft production in some form or other, and it is obvious that these firms will also play an important part in the production of aircraft after the war.

Aircraft manufacturers will find that this Company's illustrated fortnightly stock and quotation list will materially assist them in speeding up and increasing their output.

The works, which have been fitted with many new machine tools, are being extended, and remain for the present at Little James Street, Holborn, W.C.1, and the West End Offices of the Company are at 166, Piccadilly, W.1, as hitherto.

The change has necessitated an alteration of telephone number to Gerrard 276 (two lines), and the telegraphic address will now be "Upcast, Rand, London."

AN ADDRESS TO NOTE.

The address of Mr. Ernest Garton, honorary secretary of the British Ignition Apparatus Association, is now No. 9, Northumberland Road, Leamington Spa, to which all letters and communications in connection with the Association should be sent.

ECONOMISING HIGH-SPEED TOOL STEELS.

"From the communications which reach us" (write Barimar, Ltd., of 10, Poland Street, Oxford Street, W.1), "an impression seems to have got abroad that the welding of high-speed tools to shanks of common metal is an innovation. This is a mistake. Our managing director, Mr. C. W. Brett, saw a demonstration of the process in our Paris works as far back as 1906. The great developments now taking place along these lines are entirely due to the abnormal cost of high-speed steel, and as practically every postal delivery brings new applications from engineers in all parts of the country, it seems clear that the benefits of this system are now being fully realised."

A CURIOUS PRECEDENT.

The following letter has been received:—

Sir,—Though we are far from desiring to see the British Government everywhere adopting or imitating the innovations of Allied or other Governments, we think the Premier might well take a leaf out of the book of Governor Whitman, of New York State. The Governor recently met in conference the Editors of the various technical journals in the State, desiring to get reliable evidence upon questions of mechanical production, transport, coal and timber conservation, the provision of machinists and toolmakers, and other vital factors essential to the successful prosecution of the war. As a result, the Governor has now a committee of five Editors acting in an advisory capacity.

Perhaps no class in the community has its fingers more completely upon the pulse of British industries than the men who so worthily and efficiently edit our technical Press, and we feel sure they might with advantage be called in to the State councils where accurate information is above all things essential. At such a moment as this, when, to take only three important branches of public service, the Air, Agriculture, and Marine Departments, there is urgent need for the wisest and sanest counsels as well as driving forces, we think nothing but good could come by the introduction of editorial assistance.

(Signed) Barimar Ltd. (Scientific Welding Engineers)
C. W. Brett,
Managing Director and General Manager.

London, W., Sept. 14th, 1917.

[Mr. Brett's suggestion is certainly interesting, but one cannot imagine that it could possibly be adopted in England, where newspaper editors are regarded by those in high places either as mere conduits for official opinions, or cheaply-bought mouthpieces of those in power—when on the side of the authorities—or else as mud-slinging gutter-dwellers in the pay of place or money hunters—when on the side of the critics of the authorities. It has not yet occurred to our political masters and their appointees that newspaper editors may be men of some intelligence and education who are possessed of a keen desire to do their best for their country.—C. G. G.]

THE AEROPLANE

Acetylene Welding Plant—

Imperial Light, Ltd., 123, Victoria St., S.W. "Edibras, Phone, London." Victoria 3540.

Aeroplane Manufacturers—

Aircraft Manufacturing Co., Ltd., Hendon. "Airmanship, Hyde, London." Kingsbury 180.

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. "Armstrong Aviation, Newcastle-on-Tyne." Gosforth 500.

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds "Propellors, Leeds." Roundhay 345 (3 lines).

Boulton & Paul, Ltd., Rose Lane Works, Norwich "Aviation, Norwich." Norwich 851.

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. "Aviation, Bristol." Bristol 3906.

British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. "Caudroplan, Crickle, London." Hampstead 5551.

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.

Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145

Eastbourne Aviation Co., Ltd., Eastbourne. "Aircraft, Eastbourne." Eastbourne 1176.

Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. "Volplane, Hyde, London." Kingsbury 120.

Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. "Hydrophid, Crickle, London." Hampstead 7420.

Mann, Egerton & Co., Aircraft Works, Norwich. "Motors, Norwich." Norwich 482 (4 lines).

Martinsyde, Ltd., Brooklands, Byfleet. "Martinsyde, Weybridge." Woking 331; Byfleet 171.

National Aircraft Co., Ltd., 15, Hacknev Road, N.E.2. London Wall 6725.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. "Nieuscout, Crickle, London." Willesden 2455.

Norman-Thompson Flight Co., Ltd., Bognor. "Soaring, Bognor." Bognor 48.

The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. "Carbodis, London." Putney 2240-2241.

Roe, A. V., & Co., Ltd., Manchester. "Triplane, Manchester." City 8530-8531, Manchester.

Sage, Frederick & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.

Saunders, S. E., Ltd., East Cowes, I.O.W. "Consuta, East Cowes." Cowes 193.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. "Tested, Phone, London." Regent 378.

Sopwith Aviation Co., Ltd., Kingston-on-Thames. "Sopwith, Kingston." Kingston 744.

Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. "Gunsignrush, Estrand, London." City 89.

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. "Vickerfyta, Knights, London." Kensington 6810.

Waring & Gillow, Ltd., Hammersmith. "Warisen, Ox, London." Museum 5000.

Westland Aircraft Works, Yeovil. "Aircraft, Yeovil." Yeovil 129.

White, J. Samuel, & Co., Ltd., East Cowes. "White, East Cowes." Cowes 3.

Airships—

Airships, Ltd., High Street, Merton. Wimbledon 1314.

Short Bros., Rochester, Eastchurch, and Whitehall House, S.W. "Tested, 'Phone, London." Regent 378.

Aluminium Castings—

Coan, R. W., 219, Goswell Road, London, E.C.1 "Krankases, Isling, London." City 3846.

Aluminium Presswork (Stampings, Etc.)—

Willans & Robinson, Ltd., Victoria Works, Rugby. "Willans, Rugby." Rugby 112 (3 lines).

Bearings (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. "Yes, Leeds." Central 3927.

Brass Sheets for Tipping Propellers—

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. "Lucraftia, London." Avenue 7217.

Pritt & Co., 46, Fenchurch Street, London, E.C.3. "Poetry, Fen, London." Avenue 995, 996, and 7006.

Buildings—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. "Aviation Norwich." Norwich 851.

Fairby Construction Co., Ltd., 117, Victoria Street, S.W.1. "Bizfibild, London." Victoria 8868.

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313

Rubery Owen & Co., Darlaston, South Staffs. "Roofs, Darlaston." Darlaston 87 (3 lines).

The Wilfley Co., Ltd., Salisbury House, London Wall, E.C.2. "Wrathless, Phone, London." City 2681-2

Cable Coverings and Cable Controls—

Herbert Terry & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61.

Capstan Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.

Carburettors—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road, S.W.1. Victoria 4070.

Castings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. "Lucraftia, London." Avenue 2217.

Castings (Aluminium, Brass, Bronze, Machined or Rough)—

Coan, R. W., 219, Goswell Road, London, E.C.1. "Krankases, Isling, London." City 3846.

Gabriel & Co., 4 and 5, A B Row, Birmingham "Gabriel, Birmingham." Central 1223.

Willans & Robinson, Ltd., Victoria Works, Rugby. "Willans, Rugby." Rugby 112 (3 lines).

Cellon—

Cellon, Ltd,, Broad Street House, New Broad Street, E.C.2. "Ajawb, London." London Wall 5359-3622.

Celluloid (Non-Flam.)—

Greenhill & Sons, 8, Water Lane, E.C. "Greenberg, London." Central 1306-7.

London Label Co., Beckton Road, E.16. "Lonlabel, Canning, London." East 1300.

Clothing—

Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.

Dunhill's Ltd., Euston Road, N.W.1. "Dunsend, London." North 3405-6.

Hazel & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.

Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—

Accles & Pollock, Ltd., Oldbury, Birmingham. "Accles, Oldbury." Oldbury 111 (4 lines).

B. D. V. Aircraft Spares, Syon Chambers, 162, Kew Road, Richmond, Surrey. "Aeros, Richmond." Richmond 1681.

Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead, 3728.

The Aircraft Construction Co., Harley Works, Beckton Road, E.16. "Aercracons, Canning, London." East 1300.

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. "Cordage, Greenock." Greenock 618.

Cords, Tapes, and Threads—

MacLennan, J., & Co., 30. Newgate Street, E.C.1. And at Glasgow. City 3115.

Dopes—

British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. "Tetrafree, Piccy, London." Gerrard, 2312.

British Cellulose Co., 8, Waterloo Place, S.W.1. "Cellutate, London." Regent 4046.

Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. "Ajawb, London." London Wall 5359-3622.

Clark, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. "Pearline, Vic, London." Victoria 2923.

Electrical Accessories—

Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. "Installing, Euston, London." Museum 70.

Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. "Fahrenheit, Birmingham." Midland 081.

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. "Ediswan, Enfield." Enfield 520 (6 lines).

Electric Cables—

E. Kalker & Co., Coventry. "Kalker, Coventry." Coventry 24x.

Engines and Parts—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. "Pump, Bedford." Bedford No. 1.

Arrol-Johnston, Ltd., Dumfries. "Mocar, Dumfries." Dumfries 281-282.

The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000.

Beardmore Aero Eng., Ltd., 112, Great Portland Street, W.1. "Beardmore, London." Gerrard 238.

Dudbridge Iron Works, Ltd. (Salmson), 87, Victoria Street, London S.W.1. "Aeroflight, Vic, London." Vic 7026.

Gordon Watney & Co., Ltd., Weybridge. "Mercédès, Weybridge." Weybridge 550 (7 lines).

Green Engine Co., Ltd., Twickenham. Richmond 1293.

Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. "Gwynne, Hammersmith." Hammersmith 1010.

Rolls-Royce, Ltd., 14 and 15, Conduit St., W.1. "Rolhead, London." Gerrard 1654-5-6.

The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Sturtevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.

Sunbeam Motor Car Co., Ltd., Wolverhampton. "Moorfield, Wolverhampton." Wolverhampton 085.

The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W. "Elevenfold, London." Walthamstow 408 (2 lines).

Willans & Robinson, Ltd., Victoria Works, Rugby. "Willans, Rugby." Rugby 112 (3 lines).

Flexible Shafts—

Herbert Terry & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61.

Flying Schools—

Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. "Etches, Winton." Bournemouth 1160.

Cambridge School of Flying & Aerodrome Co., Ltd., 30b, St. Andrews Street, Cambridge.

Furniture (Office)—

Cookes (Finsbury), Ltd., Finsbury Pavement House, London, E.C.2. London Wall 573 and 6179.

Galvanising—

Boulton & Paul, Ltd., Rose Lane Works, Norwich. "Aviation, Norwich." Norwich 851.

Cowper-Coles Manufacturing Co., Sunbury-on-Thames. Sunbury 37.

Gears—

Moss Gear Co., Ltd., Thomas Street, Aston, Birmingham. "Mosgear, Birmingham." East 407.

Glue—

Improved Liquid Glues Co., Ltd., Gt. Hermitage Street, E. (Croid.). "Excroiden, Wapp, London." Avenue 3178.

Mendine Co., 8, Arthur Street, E.C. Bank 5873.

Goggles—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. "Shatterlys, Piccy, London." Regent 1340.

Heating and Ventilating—

Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. "Comyn, Ching, Westcent, London." Gerard 1077 (3 lines).

Chas. P. Kinnell & Co., Ltd., 65 & 65a Southwark Street, London, S.E.1. "Kinnell, London." Hop 372 (2 lines).

Instruments—

British Wright Co., Ltd., 33, Chancery Lane, W.C.2. Holborn 1308.

Instruments (Scientific, Altimeters, etc.)—

Short & Mason, Ltd., Macdonald Road, Walthamstow, E.17. "Aneroid, Phone, London." Walthamstow 180.

Machine Tools—

Brewster & Co., 11, Queen Victoria Street, E.C.4. "Circumfuse, Cannon, London." City 768.

Magneto Driving Pieces—

Herbert Terry & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61.

Magnetos—

The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. "Corlton, Coventry." Coventry 1008-1009.

The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. "Vicksmag, Phone, London." Museum 430.

Metal Manufacturers—

Clifford, Chas., & Sons, Ltd., Birmingham. "Clifford, Birmingham." Central 42-43.

Metals in General—

Samuel Mercer & Co., 198, Upper Thames Street, E.C.4. "Reconciled, Cannon, London." City 6342.

Pritt & Co., 46, Fenchurch Street, London, E.C.3. "Poetry, Fen, London." Avenue 995, 996, and 7996.

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Metal Parts and Fittings—

Accles & Pollock, Ltd., Oldbury, Birmingham. "Accles, Oldbury." Oldbury 111 (3 lines).
Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. "Upcast, Holb, London." Holborn 858.
Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. Willesden 2207.
Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) "Bayliss, Wolverhampton." Wolverhampton 1041.
The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. "Handicraft." Central 3705.
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. "Propellors, Leeds." Roundhay 345 (3 lines).
W. H. Briscoe & Co., Ltd., 51 and 52, Park Street, Birmingham. "Brisk, Bham." Central 550.
The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow, London. "Golshel, Hounslow." Hounslow 254.
Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. "Installing, Euston road, London." Museum 70.
Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham "Fremo, Birmingham." Kings Norton 261.
Rubery, Owen, & Co., Ltd., Darlaston. "Roofs, Darlaston." Darlaston 87.
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. "Sankey, Wellington, Salop." Wellington 66.
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.
The Aircraft Construction Co., Harlev Works, Beckton Road, E.16. "Aercracons, Canning, London" East 1300.
Thompson Bros., Ltd., Bradley, Bilston. "Thomoson Bros, Bilston." Bilston 10.
Wooler Engineering Co., Ltd., Old Oak Common Lane, Willesden Junction. N.W.10.

Metal Shearing Tools—

Montgomery, Smith, & Co., Ltd., Tangent Works, Keynsham, near Bristol. "Ingenuity, Saltford." Keynsham 21.

Metal Spinnings—

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham."

Metric Bolts—

Central 1223.
Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.
Rubery Owen & Co., Darlaston, South Staffs. "Roofs, Darlaston." Darlaston 87 (3 lines).

Miscellaneous—

Anderson, D., & Son, Ltd. (Roofs), Belfast. "Anderson, Belfast." Belfast 4033-4034-4035.
Anti-Glare Glass Co., Ltd., 76, Turnmill Street, E.C. Central 3731.
Bowden Wire, Ltd., Willesden Junction, "Bowirelim, Harles, London." Willesden 2400 (3 lines).
Brown Bros., Ltd., Great Eastern Street, E.C.1. "Imbrowned, Bethroad, London." London Wall 6300.
Edison Swan Electric Co., Ponder's End. (Lamps.) "Ediswan, Enfield." Enfield 520 (6 lines).
Endolithic Manufacturing Co., Ltd., 61½, Fore Street, London, E.C.2. Labels in Metal, Ivory, Ivorine, etc.
Herbert Frood Co., Ltd., Chapel-en-le-Frith. "Frodobrake, Birmingham." Central 703.
Glasso Manufacturing Co., Ltd., 211, City Road, E.C. City 9558.
London Label Co., Ltd., Harley Works, Beckton Road E.16. "Nonflamoid" Noninflammable Celluloid. "Lonlabel, Canning, London." East 1300.
MacLennan, J., & Co., 30, Newgate Street, E.C.1., and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—

Arrol Johnston, Ltd., Dumfries. "Mocar, Dumfries." Dumfries 281-282.
Mann, Egerton & Co., Ltd., 370/381, Euston Road, London, N.W.1. "Manegecar, Eusroad, London." Museum 70.
Standard Motor Car Co., Coventry. "Flywheel, Coventry." Coventry 530 (4 lines).

Nameplates and Labels—

Endolithic Manufacturing Co., Ltd., 61½, Fore Street, London, E.C.2.
The Clegg Metal Engraving Co., Chatsworth Works, Worthing. "Clegg Worthing."

Observation Panels—

Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. "Shatterlys, Piccy, London." Regent 1340.

Patent Agents—

King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.
Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.
Stanley Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Petrol Storage (Bulk)—

Bywater & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. "Bywaterist, London." Gerrard 2220.

Piston Rings—

British Chuck & Piston Ring Co., Coventry. "Rings, Coventry." Coventry 723.

Power Presses and Dies—

Bliss, E. W., & Co., 2a, Pocock Street, Blackfriars Road, London, S.E.1. "Blissdon, London." Hop 4340.

Presswork—

Rubery Owen & Co., Darlaston, South Staffs. "Roofs, Darlaston." Darlaston 87 (3 lines).
Terry Herbert & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61.

Propellers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. "Propellors, Leeds." Roundhay 345 (3 lines).
Boulton & Paul, Ltd., Rose Lane Works, Norwich. "Aviation, Norwich." Norwich 851.
Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. "Ebora, Kingston." Kingston 672.
Integral Propeller Co., Ltd. "Aviprop, Hyde, London." Hendon 9. Kingsbury 104.
Lang Propeller, Ltd., Weybridge. "Aerosticks, Weybridge." Weybridge 520-521.
Mann, Egerton & Co., Ltd., Aircraft Works, Norwich. "Motors, Norwich." Norwich 482 (4 lines).
Oddy, W. D., & Co., Leeds. "Airscrews, Leeds." Central 291, Leeds.
Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.
Stanley Aviation Co., 67, Kingsland Road, E.2. City 8347.
Westland Aircraft Works, Yeovil. "Aircraft, Yeovil." Yeovil 129.

Rigging for Aircraft—

Cradock, G., & Co., Ltd., Wakefield, England. "Cradock, Wakefield." Wakefield 466.

"Royal Ediswan Half-Watt Type Lamps"—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. "Ediswan, Enfield."

Safety Belts— Enfield 520 (6 lines).

Holmes, C. H., & Son, 38, Albert Street, Manchester. "Semloh, Manchester." City 4432.
Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.

Sand and Die Castings—

Coan, R. W., 219, Goswell Road, London, E.C. "Krankases, Isling, London." City 3846.

Scientific Instruments—

The Foster Instrument Co., Letchworth, Herts. "Instrument, Leeds." Chapeltown 474.

Seaplane Manufacturers—

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. "Propellors, Leeds." Roundhay, 345 (3 lines).
Mann, Egerton & Co., Ltd., Aircraft Works, Norwich. "Motors, Norwich." Norwich 482 (4 lines).
The Norman Thompson Flight Co., Ltd., Middleton, Bognor. "Soaring, Bognor." Bognor 48.
Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.
Short Bros., Rochester. "Seaplanes, Rochester." Chatham 627.
Supermarine Aviation Co., Ltd., Southampton. "Supermarine, Southampton." Southampton 1337.

Seats for Aeroplanes—

Bowser, E., Art Cane Works, 50 Park Lane, Leeds. Central 3437.

Shackles—

The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. "Golshel, Hounslow." Hounslow 254.

Sheet Metal Pressings—

Accles & Pollock, Ltd., Oldbury, Birmingham. "Accles, Oldbury." Oldbury 111 (3 lines).
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. "Propellors, Leeds." Roundhay 345.
Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 497 Birmingham.
Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. "Colpressed, Birmingham." Central 7188.
Rubery Owen & Co., Darlaston, South Staffs. "Roofs, Darlaston." Darlaston 87 (3 lines).

Sheet Metal Work—

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.
Rubery Owen & Co., Darlaston, South Staffs. "Roofs, Darlaston." Darlaston 87 (3 lines).
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Shock Absorbers (Elastic Cord)—

Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.
Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.

Sparking Plugs—

Forward Motor Co., Summer Row, Birmingham. Central 6259.
Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4670.
Lodge Sparking Plug Co., Ltd., Rugby. "Igniter, Rugby." Rugby 235.
Ripault, Leo, & Co., Ltd. (Oleo Plugs), 64a, Poland Street, W.1. "Ripault, Reg, London." Gerrard 7758.

Springs—

Dart Spring Co., West Bromwich. "Dart, West Bromwich." West Bromwich 322.
Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.
Terry, Herbert, & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61 (3 lines).

Steel—

Firth, Thos., & Sons, Sheffield. "Firth, Sheffield." Sheffield 3230 to 3237.
Nicklin, Bernard, & Co., Birmingham. "Bernico, Birmingham." Smithwick 224.

Steel Tension Wires—

Cradock, G., & Co., Ltd., Wakefield. "Cradock, Wakefield." Wakefield 466 (3 lines).

Steel Tubes for Aeroplanes—

Accles & Pollock, Ltd., Oldbury, Birmingham. "Accles, Oldbury." Oldbury 111 (3 lines).

Taper Pins—

Mountford, Fredk. (Birmingham), Ltd., Fremo Works, Lifford, Birmingham. "Fremo, Birmingham." King's Norton 261-262.

Tapes and Smallwares—

MacLennan, John, & Co., 30, Newgate Street, E.C.1. And at Glasgow City 3115.
James North Hardy & Son, Ltd., 54, Portland Street, Manchester. "Hardson, Manchester." Central 6471.

Timber—

Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. "Entikosil, Vic, London." Victoria 5073, 4210.
Brown, R. F., & F. W., Wollaton Saw Mills, near Nottingham. "Brown's Saw Mills, Wollaton." Nottingham 1526.
J. Owen & Sons, Ltd., 199a, Borough High Street, S.E.1. "Bucheron, London." Hop 3811 (2 lines).

Time Recorders—

Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Turnbuckles—

Rubery Owen & Co., Darlaston, South Staffs. "Roofs, Darlaston." Darlaston 87 (3 lines).

Tyres and Wheels—

The Beldam Tyre Co., Ltd., Brentford, Middlesex. "Beldam Tyres, Brentford." Ealing 125-126.
The Palmer Tyre, Ltd., Shaftesbury Avenue. "Tyricord, Weskent." Gerrard 1214 (4 lines).

Varnishes—

Clark, R. Ingham, & Co., Caxton House, S.W.1. "Pearline, Vic, London. Victoria 2923.
Harland, W., & Son, Merton, London, S.W.19. "Harland, Wimbledon 45." Wimbledon 45 and 1395.
Naylor Bros., Ltd., Southall, Middlesex. "Naylor, Southall." Southall 30.

Washers—

Herbert Terry & Sons, Ltd. Redditch. "Springs, Redditch." Redditch 61.

Watchmakers and Jewellers (Silver Models)—

Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—

Barimar, Ltd., 10, Poland Street, W.1. "Barimar, Reg, London." Gerrard 8173.

Wind Shields—

Auster, Ltd., 133, Long Acre, W.C. "Winflector, London." Regent 5910.
London Label Co., Ltd., Hadley Works, Beckton Road, E.16. "Nonflamoid" Noninflammable Celluloid. "Lonlabel, Canning, London." East 1300.
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. "Shatterlys, Piccy, London." Regent 1340.

Wires and Cables (Aeroplanes)—

Bruntons, Musselburgh, Scotland. "Wiremill, Musselburgh." Musselburgh 28.
Cradock, Geo., & Co., Ltd., Wakefield. "Cradock, Wakefield." Wakefield 466 (3 lines).

Wirework—

Terry Herbert & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61.

Woodworking Machinery—

Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. "Robinson, Rochdale." Rochdale 467.
Sagar, J., & Co., Ltd., Halifax. "Sawtooth, Halifax." Halifax 136.
Wadkin & Co., Leicester. "Woodworker, Leicester." Leicester 2614.

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Acetylene Welding Plant—
Imperial Light, Ltd., 123, Victoria St., S.W. "Edibras, Phone, London." Victoria 3540.

Aeroplane Manufacturers—
Aircraft Manufacturing Co., Ltd., Hendon. "Airmanship, Hyde, London." Kingsbury 180.
Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne. "Armstrong Aviation, Newcastle-on-Tyne." Gosforth 500.
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. "Propellors, Leeds." Roundhay 345 (3 lines).
Boulton & Paul, Ltd., Rose Lane Works, Norwich. "Aviation, Norwich." Norwich 851.
British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol. "Aviation, Bristol." Bristol 3906.
British Caudron Co., Ltd., Broadway, Cricklewood, N.W.2. "Caudroplan, Crickle, London." Hampstead 5551.
Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 4728.
Davidson Aviation Co., Ltd., Hammersmith, W.6. Hammersmith 1144-1145
Eastbourne Aviation Co., Ltd., Eastbourne. "Aircraft, Eastbourne." Eastbourne 1176.
Grahame-White Aviation Co., Ltd., London Aerodrome, Hendon. "Volplane, Hyde, London." Kingsbury 120.
Handley Page, Ltd., 110, Cricklewood Lane, N.W.2. "Hydrophid, Crickle, London." Hampstead 7420.
Mann, Egerton & Co., Aircraft Works, Norwich. "Motors, Norwich." Norwich 482 (4 lines).
Martinsyde, Ltd., Brooklands, Byfleet. "Martinsyde, Weybridge." Woking 331; Byfleet 171.
National Aircraft Co., Ltd., 15, Hackney Road, N.E.2. London Wall 6725.
"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2. "Nieuscout, Crickle, London." Willesden 2455.
Norman-Thompson Flight Co., Ltd., Bognor. "Soaring, Bognor." Bognor 48.
The Regent Carriage Co., Ltd., 126/132, New King's Road, Fulham, S.W.6. "Carbodis, London." Putney 2240-2241.
Roe, A. V., & Co., Ltd., Manchester. "Triplane, Manchester." City 8530-8531, Manchester.
Sage, Frederick & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.
Saunders, S. E., Ltd., East Cowes, I.O.W. "Consuta, East Cowes." Cowes 193.
Short Bros., Rochester, Eastchurch and Whitehall House, S.W. "Tested, Phone, London." Regent 378.
Sopwith Aviation Co., Ltd., Kingston-on-Thames. "Sopwith, Kingston." Kingston 744.
Standard Aircraft Manufacturing Co., Effingham House, Arundel Street, W.C.2. "Gunsignrush, Estrand, London." City 80.
Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. "Vickersfyta, Knights, London." Kensington 6810.
Waring & Gillow, Ltd., Hammersmith. "Warisen, Os, London." Museum 5000.
Westland Aircraft Works, Yeovil. "Aircraft, Yeovil." Yeovil 129.
White, J. Samuel, & Co., Ltd., East Cowes. "White, East Cowes." Cowes 3.

Airships—
Airships, Ltd., High Street, Merton. Wimbledon 1314.
Short Bros., Rochester, Eastchurch, and Whitehall House, S.W. "Tested, 'Phone, London." Regent 378.

Aluminium Castings—
Coan, R. W., 219, Goswell Road, London, E.C.1 "Krankases, Isling, London." City 3846.

Aluminium Presswork (Stampings, Etc.)—
Willans & Robinson, Ltd., Victoria Works, Rugby. "Willans, Rugby." Rugby 112 (3 lines).

Bearings (Etonia Cast Phosphor Bronze)—
Yorkshire Engineering Supplies, Ltd., Wortley, Leeds. "Yes, Leeds." Central 3927.

Brass Sheets for Tipping Propellers—
Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. "Lucraftio, London." Avenue 2217.
Pritt & Co., 46, Fenchurch Street, London, E.C.3. "Poetry, Fen, London." Avenue 6056, 996, and 7006.

Buildings—
Boulton & Paul, Ltd., Rose Lane Works, Norwich. "Aviation Norwich." Norwich 851.
Fairby Construction Co. Ltd., 127, Victoria Street, S.W.1. "Bifibild, London." Victoria 8868.
Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey. Wimbledon 1313
Rubery Owen & Co., Darlaston, South Staffs. "Roofs, Darlaston." Darlaston 87 (3 lines).
The Whitley Co., Ltd., Salisbury House, London Wall, E.C.2. "Wrathless, Phone, London." City 2681-2

Cable Coverings and Cable Controls—
Herbert Terry & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61.

Capstan Work—
Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.

Carburettors—
Hobson, H. M., Ltd., 20, Vauxhall Bridge Road, S.W.1. Victoria 4070.

Castings—
Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.
Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. "Lucraftio, London." Avenue 2217.

Castings (Aluminium, Brass, Bronze, Machined or Rough)—
Coan, R. W., 219, Goswell Road, London, E.C.1. "Krankases, Isling, London." City 3846.
Gabriel & Co., 4 and 5, A B Row, Birmingham "Gabriel, Birmingham." Central 1223.
Willans & Robinson, Ltd., Victoria Works, Rugby. "Willans, Rugby." Rugby 112 (3 lines).

Cellon—
Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. "Ajawb, London." London Wall 5359-3622.

Celluloid (Non-Flam.)—
Greenhill & Sons, 8, Water Lane, E.C. "Greenberg, London." Central 1306-7.
London Label Co., Beckton Road, E.16. "Lonlabel, Canning, London." East 1300.

Clothing—
Burberry's, Ltd., Haymarket, S.W.1. Regent 2165.
Dunhill's Ltd., Euston Road, N.W.1. "Dunsend, London." North 3405-6.
Hazell & Co., 4, Princes Street, Hanover Square, W.1. Mayfair 4071-2.
Robinson & Cleaver, Ltd., Regent Street, London, W.1. Gerrard 1070.

Component Parts—
Accles & Pollock, Ltd., Oldbury, Birmingham. "Accles, Oldbury." Oldbury 111 (4 lines).
B. D. V. Aircraft Spares, Syon Chambers, 161, Kew Road, Richmond, Surrey. "Aeros, Richmond." Richmond 1681.
Central Aircraft Co., Palmerston Works, High Road, Kilburn, N.W.6. Hampstead 3728.
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. "Aerocranes, Canning, London." East 1300.
The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland. "Cordage, Greenock." Greenock 618.

Cords, Tapes, and Threads—
Mackennan, J., & Co., 30, Newgate Street, E.C.1. And at Glasgow. City 3115.

Dopes—
British Aeroplane Varnish Co., Ltd., 166, Piccadilly, W.1. "Tetrafree, Piccy, London." Gerrard, 2312.
British Cellulose Co., 8, Waterloo Place, S.W.1. "Cellulate, London." Regent 4046.
Cellon, Ltd., Broad Street House, New Broad Street, E.C.2. "Ajawb, London." London Wall 5359-3622.
Clark, Robert, Ingham & Co., Ltd., Caxton House, S.W.1. "Pearline, Vic, London." Victoria 2923.

Electrical Accessories—
Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. "Installing, Euston, London." Museum 70.
Premier Electric Heaters, Ltd., 258, 259, and 360, Bradford Street, Birmingham. "Fahrenheit, Birmingham." Midland 681.
The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex. "Ediswan, Enfield." Enfield 520 (6 lines).

Electric Cables—
E. Kalker & Co., Coventry. "Kalker, Coventry." Coventry 243.

Engines and Parts—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. "Pump, Bedford." Bedford No. 1.
Arrol-Johnston, Ltd., Dumfries. "Mocar, Dumfries." Dumfries 281-282.
The Beatty School of Flying, Ltd., The Broadway, Cricklewood, N.W.2. Hampstead 3000.
Beardmore Aero Eng., Ltd., 117, Great Portland Street, W.1. "Beardmore, London." Gerrard 238.
Dudbridge Iron Works, Ltd. (Salmson), 87, Victoria Street, London S.W.1. "Aerobight, Vic, London." Vic 7026.
Gordon Watney & Co., Ltd., Weybridge. "Mercedes, Weybridge." Weybridge 550 (7 lines).
Green Engine Co., Ltd., Twickenham. Richmond 1203.
Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W. "Gwynne, Hammersmith." Hammersmith 1010.
Rolls-Royce, Ltd., 14 and 15, Conduit St., W.1. "Rolled, London." Gerrard 1634-36.
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.
Startevant, B. F., Co., Ltd., Hyde Park, Boston, U.S.A.
Sunbeam Motor Car Co., Ltd., Wolverhampton. "Moorfield, Wolverhampton." Wolverhampton 785.
The Gnôme & Le Rhône Engine Co., Ltd., 47, Victoria Street, S.W. "Clerkenold, London." Walthamstow 408 (2 lines).
Willans & Robinson, Ltd., Victoria Works, Rugby. "Willans, Rugby." Rugby 112 (3 lines).

Flexible Shafts—
Herbert Terry & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61.

Flying Schools—
Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth. "Etches, Winton." Bournemouth 1160.
Cambridge School of Flying & Aerodrome Co., Ltd., 30b, St. Andrews Street, Cambridge.

Furniture (Office)—
Cookes (Finsbury), Ltd., Finsbury Pavement House, London, E.C.2. London Wall 573 and 6179.

Galvanising—
Boulton & Paul, Ltd., Rose Lane Works, Norwich. "Aviation, Norwich." Norwich 851.
Cowper-Coles Manufacturing Co., Sunbury-on-Thames. Sunbury 37.

Gears—
Moss Gear Co., Ltd., Thomas Street, Aston, Birmingham. "Mosgear, Birmingham." East 407.

Glue—
Improved Liquid Glues Co., Ltd., 61, Hermitage Street, E. (Croid.). "Excroiden, Wapp, London." Avenue 3178.
Mendine Co., 8, Arthur Street, E.C. Bank 5873.

Goggles—
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. "Shatterlys, Piccy, London." Regent 1340.

Heating and Ventilating—
Comyn, Ching & Co., Ltd., Castle Street, Long Acre, W.C. "Comyn, Ching, Westcent, London." Gerrard 1077 (3 lines).
Chas. P. Kinnell & Co., Ltd., 65 & 65a Southwark Street, London, S.E.1. "Kinnell, London." Hop 372 (2 lines).

Instruments—
British Wright Co., Ltd., 33, Chancery Lane, W.C.2. Holborn 1308.

Instruments (Scientific, Altimeters, etc.)—
Short & Mason, Ltd., Macdonald Road, Walthamstow, E.17. "Aneroid, Phone, London." Walthamstow 180.

Machine Tools—
Brewster & Co., 11, Queen Victoria Street, E.C.4. "Circumfuse, Cannon, London." City 768.

Magneto Driving Pieces—
Herbert Terry & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61.

Magnetos—
The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry. "Corlton, Coventry." Coventry 1008-1009.
The British Lighting & Ignition Co., Ltd., 204, Tottenham Court Road, W.1. "Vickmag, Phone, London." Museum 430.

Metal Manufacturers—
Clifford, Chas., & Sons, Ltd., Birmingham. "Clifford, Birmingham." Central 4243.

Metals in General—
Samuel Mercer & Co., 198, Upper Thames Street, E.C.4. "Reconciled, Cannon, London." City 6342.
Pritt & Co., 46, Fenchurch Street, London, E.C.3. "Poetry, Fen, London." Avenue 995, 996, and 7996.

Metal Parts and Fittings—
Accles & Pollock, Ltd., Oldbury, Birmingham "Accles, Oldbury." Oldbury 111 (3 lines).
Aircraft Supplies Co., Ltd., 17, John Street, Theobald's Road, W.C. "Upcast, Holb, London." Holborn 858.
Arnott & Harrison, Ltd., Hythe Road, Willesden Junction. "Rowiridim, Harles, London." Willesden 2206.
Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (Bolts and Nuts.) "Bayliss, Wolverhampton, Wolverhampton 1041.
The Birmingham Guild, Ltd., 45, Gt. Charles Street, Birmingham. "Handicraft." Central 3705.
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. "Propellors, Leeds." Roundhay 345 (3 lines).
W. H. Briscoe & Co., Ltd., 52 and 52a, Park Street, Birmingham. "Brisk, Bham." Central 550.
The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow, London. "Golshel, Hounslow." Hounslow 254.
Mann, Egerton & Co., Ltd., 177, Cleveland Street, London, W.1. "Installing, Euston Road, London." Museum 70.
Mountford, Fredk., Ltd., Fremo Works, Lilford, Birmingham "Fremo, Birmingham." Kings Norton 261.
Rubery, Owen, & Co., Ltd., Darlaston. "Roofs, Darlaston." Darlaston 87.
Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire. "Sankey, Wellington, Salop." Wellington 66.
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.
The Aircraft Construction Co., Harley Works, Beckton Road, E.16. "Aerocranes, Canning, London." East 1300.
Thompson Bros., Ltd., Bradley, Bilston. "Thompson Bros., Bilston." Bilston 10.
Wooler Engineering Co., Ltd., Old Oak Common Lane, Willesden Junction, N.W.10.

Metal Shearing Tools—
Montgomery, Smith, & Co., Ltd., Tangent Works, Keynsham, near Bristol. "Incentive, Saltford." Keynsham 21.

Metal Spinnings—
Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham."

Metric Bolts—
Cashmore Bros., Zota Works, Hildreth Street, Balham, S.W. Battersea 415.
Rubery Owen & Co., Darlaston, South Staffs. "Roofs, Darlaston." Darlaston 87 (3 lines).

Miscellaneous—
Anderson, D., & Son, Ltd. (Rools), Belfast "Anderson, Belfast." Belfast 4033-4034-4035.
Anti-Glare Glass Co., Ltd., 76, Turnmill Street, E.C. Central 3731.
Bowden Wire, Ltd., Willesden Junction, "Rowiridim, Harles, London." Willesden 2206 (3 lines).
Brown Bros., Ltd., Great Eastern Street, E.C.2. "Imbrowned, Bedhead, London." London Wall 6400.
Edison Swan Electric Co., Ponder's End, (Lamps.) "Ediswan, Enfield." Enfield 520 (6 lines).
Endolithic Manufacturing Co., Ltd., 61½, Fore Street, London, E.C.2. Labels in Metal. Ivory, Ivorine, etc. Regent 1340.
Herbert Read Co., Ltd., Chapel-en-le-Frith. "Frobrake, Birmingham." Central 703.
Glass Manufacturing Co., Ltd., 221, City Road, E.C. City 0558.
London Label Co., Ltd., Harley Works, Beckton Road E.16. "Nonflamoid" Nonflammable Celluloid. "Lonlabel, Canning, London." East 1300.
MacLennan, J., & Co., 30, Newgate Street, E.C.1, and at Glasgow. Tapes, Cords and Threads. City 3115.

Motor Cars—
Arrol Johnston, Ltd., Dumfries. "Mocar, Dumfries." Dumfries 281-282.
Mann, Egerton & Co., Ltd., 370/381, Euston Road, London, N.W.1. "Manegecar, Euston road, London." Museum 70.
Standard Motor Car Co., Coventry. "Flywheel, Coventry." Coventry 530 (4 lines).

Nameplates and Labels—
Endolithic Manufacturing Co., Ltd., 61½, Fore Street, London, E.C.2.
The Clegg Metal Engraving Co., Chatsworth Works, Worthing. "Clegg Worthing."

Observation Panels—
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. "Shatterlys, Piccy, London." Regent 1340.

Patent Agents—
King's Patent Agency, 165, Queen Victoria Street, E.C.4. Central 682.
Page & Rowlingson, 27, Chancery Lane, E.C.4. Central 332.
Stanley Popplewell & Co., 38, Chancery Lane, W.C.2. Central 1763.

Petrol Storage (Bulk)—
Bywater & Co. (The Hydraulic System), Craven House, Kingsway, London, W.C.2. "Bywaterist, London." Gerrard 2220.

Piston Rings—
British Chuck & Piston Ring Co., Coventry. "Rings, Coventry." Coventry 723.

Power Presses and Dies—
Bliss, E. W., & Co., 22, Pocock Street, Blackfriars Road, London, S.E.1. "Blissden, London." Hop 4340.

Presswork—
Rubery Owen & Co., Darlaston, South Staffs. "Roofs, Darlaston." Darlaston 87 (3 lines).
Terry, Herbert & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61.

Propellers—
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. "Propellors, Leeds." Roundhay 345 (3 lines).
Boulton & Paul, Ltd., Rose Lane Works, Norwich. "Aviation, Norwich." Norwich 851.
Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames. "Ebora, Kingston." Kingston 672.
Integral Propeller Co., Ltd. "Aviprop, Hyde, London." Hendon 9, Kingsbury 104.
Lang Propeller, Ltd., Weybridge. "Aerosticks, Weybridge." Weybridge 520-521.
Mann, Egerton & Co., Ltd., Aircraft Works, Norwich. "Motors, Norwich." Norwich 482 (4 lines).
Oddy, W. D., & Co., Leeds. "Airscrews, Leeds." Central 291, Leeds.
Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.
Stanley Aviation Co., 67, Kingsland Road, E.2. City 8347.
Westland Aircraft Works, Yeovil. "Aircraft, Yeovil." Yeovil 129.

Rigging for Aircraft—
Cradock, G., & Co., Ltd., Wakefield, England. "Cradock, Wakefield." Wakefield 466.

"Royal Ediswan Half-Watt Type Lamps"—
The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex "Ediswan, Enfield."

Safety Belts—
Enfield 520 (6 lines).
Holmes, C. H., & Son, 38, Albert Street, Manchester. "Seatbelt, Manchester." City 4434.
Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.

Sand and Die Castings—
Coan, R. W., 219, Goswell Road London, E.C. "Krankases, Isling, London." City 3846.

Scientific Instruments—
The Foster Instrument Co., Letchworth, Herts. "Instrument, Leeds." Chapeltown 474.

Seaplane Manufacturers—
Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds. "Propellors, Leeds." Roundhay, 345 (3 lines).
Mann, Egerton & Co., Ltd., Aircraft Works, Norwich. "Motors, Norwich." Norwich 482 (4 lines).
The Norman Thompson Flight Co., Ltd., Middleton, Bognor. "Soaring, Bognor." Bognor 48.
Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough." Peterborough 128.
Short Bros., Rochester. "Seaplanes, Rochester." Chatham 627.
Supermarine Aviation Co., Ltd., Southampton. "Supermarine, Southampton." Southampton 1337.

Seats for Aeroplanes—
Bowser, E., Art Cane Works, 50 Park Lane, Leeds. Central 3437.

Shackles—
The British Gold Shell Ring Co., Ltd., Inverness Road, Hounslow. "Golshel, Hounslow." Hounslow 254.

Sheet Metal Pressings—
Accles & Pollock, Ltd., Oldbury, Birmingham. "Accles, Oldbury." Oldbury 111 (3 lines).
Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds. "Propellors, Leeds." Roundhay 345.
Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.
London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham. East 407 Birmingham.
Nicholls & Lewis, Ltd., 16, Princep Street, Birmingham. "Colpressed, Birmingham." Central 7188.
Rubery Owen & Co., Darlaston, South Staffs. "Roofs, Darlaston." Darlaston 87 (3 lines).

Sheet Metal Work—
Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.
Rubery Owen & Co., Darlaston, South Staffs. "Roofs, Darlaston." Darlaston 87 (3 lines).
The Selsdon Aero & Engineering Co., Ltd., Imperial House, Kingsway, W.C.2. Regent 1181.

Shock Absorbers (Elastic Cord)—
Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.
Sage, Frederick, & Co., Ltd., Walton, Peterborough. "Sage, Peterborough."

Sparking Plugs—
Peterborough 128.
Forward Motor Co., Sumner Row, Birmingham. Central 0259.
Hobson Manufacturing Co., 29, Vauxhall Bridge Road, S.W.1. Victoria 4070.
Lodge Sparking Plug Co., Ltd., Rugby. "Igniter, Rugby." Rugby 215.
Ripault, Leo, & Co., Ltd. (Oleo Plugs), 630, Poland Street, W.1. "Ripault, Reg, London." Gerrard 7758.

Springs—
Dart Spring Co., West Bromwich. "Dart, West Bromwich." West Bromwich 322.
Gabriel & Co., 4 and 5, A B Row, Birmingham. "Gabriel, Birmingham." Central 1223.
Terry, Herbert, & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61 (3 lines).

Steel—
Firth, Thos., & Sons, Sheffield. "Firth, Sheffield." Sheffield 3230 to 3237.
Nicklin, Bernard, & Co., Birmingham. "Bernico, Birmingham." Smithwick 224.

Steel Tension Wires—
Cradock, G., & Co., Ltd., Wakefield. "Cradock, Wakefield." Wakefield 466 (3 lines).

Steel Tubes for Aeroplanes—
Accles & Pollock, Ltd., Oldbury, Birmingham. "Accles, Oldbury." Oldbury 111 (3 lines).

Taper Pins—
Mountford, Fredk. (Birmingham), Ltd., Fremo Works, Lilford, Birmingham. "Fremo, Birmingham." King's Norton 261-262

Tapes and Smallwares—
MacLennan, John, & Co., 30, Newgate Street, E.C.1. And at Glasgow City 3115.
James North Hardy & Son, Ltd., 54, Portland Street, Manchester. "Hardson, Manchester." Central 6471.

Timber—
Engineering Timber Co., Ltd., 9, Victoria Street, London, S.W. "Entikosil, Vic, London." Victoria 5073, 4310.
Brown, R. F., & F. W., Wellston Saw Mills, near Nottingham. "Brown's Saw Mills, Wellaton." Nottingham 1526.
J. Owen & Sons, Ltd., 199a, Borough High Street, S.E.1. "Bucheron, London." Hop 3811 (2 lines).

Time Recorders—
Gledhill-Brook Time Recorders, Ltd., 26, Victoria Street, S.W.1. Victoria 1310.

Turnbuckles—
Rubery Owen & Co., Darlaston, South Staffs. "Roofs, Darlaston." Darlaston 87 (3 lines).

Tyres and Wheels—
The Beldam Tyre Co., Ltd., Brentford, Middlesex. "Beldam Tyres, Brentford." Ealing 125-126.
The Palmer Tyre, Ltd., Shaftesbury Avenue. "Tyricord, Wesdent." Gerrard 1214 (4 lines).

Varnishes—
Clark, R. Ingham, & Co., Caxton House, S.W.1. "Pearline, Vic, London." Victoria 2923.
Harland, W., & Son, Merton, London, S.W.19. "Harland, Wimbledon 45." Wimbledon 45 and 1395.
Naylor Bros., Ltd., Southall, Middlesex. "Naylor, Southall." Southall 30.

Washers—
Herbert Terry & Sons, Ltd. Redditch. "Springs, Redditch." Redditch 61.

Watchmakers and Jewellers (Silver Models)—
Goldsmiths' & Silversmiths' Co., Ltd., 112, Regent Street, W.1. Gerrard 9091 (3 lines).

Welding Repairs—
Barimar, Ltd., 10, Poland Street, W.1. "Barimarmar, Reg, London." Gerrard 8173.

Wind Shields—
Auster, Ltd., 133, Long Acre, W.C. "Winflector, London." Regent 5910.
London Label Co., Ltd., Hadley Works, Beckton Road, E.16. "Nonflameid" Nonflammable Celluloid. "Lonlabel, Canning, London." East 1300.
Triplex Safety Glass Co., Ltd., 1, Albemarle Street, Piccadilly, W.1. "Shatterlys, Piccy, London." Regent 1340.

Wires and Cables (Aeroplanes)—
Bruntons, Musselburgh, Scotland. "Wiremill, Musselburgh." Musselburgh 28.
Cradock, Geo., & Co., Ltd., Wakefield. "Cradock, Wakefield." Wakefield 466 (3 lines).

Wirework—
Terry, Herbert & Sons, Ltd., Redditch. "Springs, Redditch." Redditch 61.

Woodworking Machinery—
Robinson, Thomas, & Son, Ltd., Railway Works, Rochdale. "Robinson, Rochdale." Rochdale 467.
Sagar, J., & Co., Ltd., Halifax. "Sawtooth, Halifax." Halifax 336.
Watkin & Co., Leicester. "Woolworker, Leicester." Leicester 1611.

MARKET REPORTS.

Prices given are for quantities on usual terms.

September 20th, 1917.

COPPER.—There is no interest whatever in the Copper Market here, and official prices continue unaltered. The situation in America is being very eagerly watched. The Government still delay fixing the price to be charged for Copper; as stated last week, there were rumours that the price would be about 22½c. per lb.; it is, however, practically certain that 25c. will be nearer the mark; this is a liberal price, but it is a very wise policy not to give producers any excuse for not exerting every ounce of effort towards giving a maximum output. Although some buyers there have been forced into the market owing to depletion of their stocks, they are apparently only buying hand to mouth, pending a settlement of the official price. The U.S.A. labour question is still unsettled; in fact, reports indicate that the position is worse. Supplies here are very satisfactory, and the authorities are still continuing the substitution of iron and steel for brass. This is certainly a wise policy.

Comparative Prices.

To-day	£120	0	0	per ton.
September, 1916	115	10	0	per ton.
September, 1915	69	0	0	per ton.
Highest price, 1916	150	0	0	per ton.

TIN.—As indicated in previous reports, the Tin Market is still far from showing a settled condition. Prices have, during the past week, fluctuated very considerably, advancing from £243 10s. to £247, and declining again to £244 15s.

Delays in arrival of shipments is partially responsible for the unsettlement, and sellers are loth to part with what stocks they hold. There are indications that there is likely to be a demand for early delivery, and this will, of course, influence prices upward.

Comparative Prices.

To-day, 18th	£224	15	0	per ton.
September 14th	245	5	0	per ton.
September 11th	242	0	0	per ton.
Last month	244	0	0	per ton.
1916	170	15	0	per ton.
Highest price, 1916	205	0	0	per ton.

LEAD.—There is very little to report. The Ministry now control all supplies, and the official prices remain unaltered. The U.S.A. Government are arranging to fix a price for American Lead, and we are given to understand that this will be between 8c. or 9c. per lb.

Comparative Prices.

Now	£30	0	0	average.
1916	29	12	6	average.
Highest, 1916	36	10	0	average.

STEEL.—The demand for Aircraft Steels continues undiminished; the output is, however, steadily increasing.

One understands that the Ministry of Munitions is negotiating for the control of Sheet Steel; as a matter of fact, it is believed that a basis price has already been suggested to the makers, but the latter are of the unanimous opinion that the price is much too low. It is to be hoped that the Ministry of Munitions will move very cautiously. Presumably the control of Aircraft Steel Sheet prices will follow.

The Cast Steel position still continues to be serious; supplies of ore are unfortunately far from being satisfactory.

ALUMINIUM.—The position remains the same, and prices are unaltered.

TIMBER.—The shortage of Timber is now affecting 3 ply, and constructors are receiving instructions to use 3-ply Satin Walnut. The results obtained from these boards are quite satisfactory, although the price is a little higher than 3-ply Ash or Birch.

One understands that further experiments with Silver Spruce substitutes have been carried out with fairly good results. It is, however, generally recognised now that it is impossible to find another wood which gives the same results as Silver Spruce. However, it is gratifying to know that there is a possibility of a fairly good substitute being adopted. Whatever is done must be done quickly, and large shipments should be imported without delay if the situation is to be saved. Walnut is still very scarce indeed, but the supplies of Mahogany appear to be fairly satisfactory.

Prices still continue very strong.

FABRIC.—The labour troubles in Ireland are still unsettled, and the position is seriously exercising the minds of the Air Board officials; also, constructors who are not fortunate enough to have maintained a large stock are viewing the state of affairs with anxiety.

One learns that there is a possibility of the strike being settled before this report is in readers' hands, and can only hope that this will be the case.

CURRENT MARKET PRICES.

(For Week Ending Sept. 21st.)

The prices given below are the prices ruling on the above date.

TERMS.—Usual for the various materials mentioned.

Prices of old metals are as quoted by scrap dealers.

Prices must not be taken as specific quotations for definite quantities delivered to any part of the country.

Aluminium.

Ingot	£225 per ton.
Remelted	£210 per ton.

Brass.

Sheets	15⅞d. per lb.
Strip	14⅞d. per lb.
Wire	15⅛d. per lb.
Tubes	16⅛d. per lb.
Castings	15d. per lb.
Turning Rod	14⅜d. per lb.
Brazed Tubes	20⅝d. per lb.

Copper.

Ingot, Standard, Cash	£120 per ton.
Ingot, Standard, 3 mos.	£119 10s. per ton.
Best Selected (nett)	£131 to £135 per ton.
Sheets	£160 per ton.
Wire	17½d. per lb.
Tubes, S.D.	19¾d. per lb.
Tubes, Brazed	19¾d. per lb.
Rivets	1s. 11½d. per lb., basis.
Tacks	1s. 11d. per lb.

Fabric.

Linen, R.A.F., 17C, Spec., 36-in. wide,	2s. 8d. p. yd.*
Linen, R.A.F., 17C, Spec., 38-in. wide,	2s. 9½d. p. yd.*
Spaced, R.A.F., 17C, Spec., 37½-in. wide,	1s. 9d. p. yd.*

Gun Metal.

Castings	1s. 8d. per lb.

Lead.

Virgin Pig	£29 per ton, c.i.f.
Virgin Pig	£30 per ton, ex Stores.
Sheets	£39 10s. per ton, D/D.
Pipes	£40 per ton.
Dry White	£46 10s. per ton, less 5 per cent.
White in Oil	£53 per ton (lots over 5 cwt. less 5 per cent.).
White in Oil	£55 per ton (lots under 5 cwt. less 5 per cent.).
Red	£42 per ton, less 2½ per cent.

Nickel.

Nickel	£200 per ton.

Phosphor Bronze.

Ingots, 5 cwt. and under	£159 to £187 per ton (subject to Copper and Tin fluctuations).
Castings	1s. 7d. to 1s. 11d. per lb.

Phosphor Copper.

Ton lots	£210 to £215 per ton.

Silver.

Silver	52d. per oz.

Solder.

Plumber's	103s.
Tinman's	135s.

Steel.

High Speed, 14 p. cent., Tungsten,	2s. 10d. per lb., Basis.*
High Speed, 18 p. cent., Tungsten,	3s. 10d. per lb., Basis.*
Bar, R.A.F., 3A Spec.,	36s. to 40s. per cwt., Basis.†
Bar, R.A.F., 1E Spec.,	78s. to 80s. per cwt., Basis.†
Sheets, R.A.F., 9A Spec.,	30s. to 32s. per cwt.†

Spelter.

English, f.o.b., Birmingham	£57.

Tin.

Tin	£244 15s. per ton.

Tinplates.

Tinplates	30s. Basis, f.o.t.

Timber.

	Official	Merchants.
Silver Spruce	10s. 4d.	17s. 9d., c.f.‡
English Ash		13s. 6d., c.f.‡
Mahogany	1s. 6d. to 1s. 10d.,	2s. 2d. to 2s. 6d., s.f.‡
Walnut	2s. to 2s. 3d.	2s. 3d. to 2s. 6d., s.f.‡

Zinc.

Sheets (American)	£100 f.o.b., New York.

*Official Prices. †Average Prices only. ‡Includes Selection and Delivery.

Scrap Materials (London Prices).

Brass, Heavy Selected	£95
Copper, Clean	£112
Copper, Brazery	£92
Lead, No Draft	£26
Zinc, Old	£40

THE WATNEY WORKERS AT PLAY.

The sports and fête organised by Messrs. Gordon Watney and Co., Ltd., which were held on Saturday, Sept. 15th, at Weybridge, made it very evident that the employees of the firm had all the essentials necessary to an enjoyable afternoon, and if it is any satisfaction to Major and Mrs. Gordon Watney, it may at once be said that the day revealed the fact that there was every evidence of perfect accord between the executive and the workers.

Needless to say, a programme which included twenty events, in or about four hundred entrants, with a prize list over the value of £140, entailed a strenuous day. The attendance at one time was a strain on the extensive grounds of St. George's College, kindly placed at the disposal of the executive by the president of the College. The natural beauty of the grounds was much enhanced by the very effective manner in which they were laid out by Mr. Dews, the chief engineer of the firm, whose untiring efforts in insuring the success of the meeting deserve the greatest praise, especially taking into consideration the enormous amount of work that is being turned out of the shops.

What has been said of Mr. Dews applies quite as much to others who worked so strenuously on the general committee. The referee, Mr. T. H. Secretan, A.A.A., fortunately, had little trouble in adjusting the trifling differences which arose simply from the eagerness displayed by the competitors. The executive committee, which consisted of Major Watney, Messrs. Eglon, Zillwood and Dews, were most energetic in assuring the success of the meeting. Above all, praise must be given to the chief steward, Mr. J. C. Costigan, the general manager of the works. His various tasks must have made the "Handy Man," famous in the annals of Winchester College, very envious. Lieut. Swaine, R.N.V.R., had all his time cut out as a starter—and to praise each official would not only occupy a great deal of space, but would be an "embarras des richesse," for the work was so evidently a labour of love with each of them—and this remark especially applies to Mrs. D. Watney.

Major Watney showed his whole-hearted determination to give the employees of the firm the best of everything by engaging the full band of the Grenadier Guards, by permission of Colonel Sir H. Streatfield, K.C.V.O., C.B. Captain Williams, M.V.O., Mus. Doc. Oxon, who is director of music, may, perhaps, have had larger audiences, but he can rest assured that, whether they may have been listeners in Paris or in the bygone days of the White City, the art of his conducting or the performance of his men was never more highly appraised than it was at Weybridge.

The presence of a very large number of wounded and convalescent soldiers gave just the required touch that linked the exuberance of the munition maker with the stern reality of those whose "bite hard" at that moment, which was so well expressed by an oversea soldier who, when asked what was the sign of a coming attack answered, "A mackerel sky—a double issue of rum and a chaplain lurking behind—and half-past the hour of dawn."

The climax came when Mrs. Gordon Watney stepped forward to present the prizes. This charming lady showed that her heart, like Major Watney's, is in the interests of the employees of Messrs. Gordon Watney and Co., Ltd., and the ringing cheers that responded to the call for a vote of thanks for what they had done must have proved to them the devotion of the workers.

Major-General Sir Alfred Turner, K.C.B., spoke just a few concise words to the vast concourse assembled round the Grand Stand. Quietly but effectively he pointed out the essentials in dealing with the Hun peril, and the singing of the "National Anthem" concluded what must be termed by all present "A Perfect Day."

The following are the results :—

100 yds. handicap (men).—Final : 1, Reeve ; 2, Bird ; 3, Forster.

Quarter-mile, open, scratch (12 miles radius).—1, T. Green, Vickers ; 2, J. E. Forster, Gordon Watneys ; 3, F. Collins, Lagonda Works.

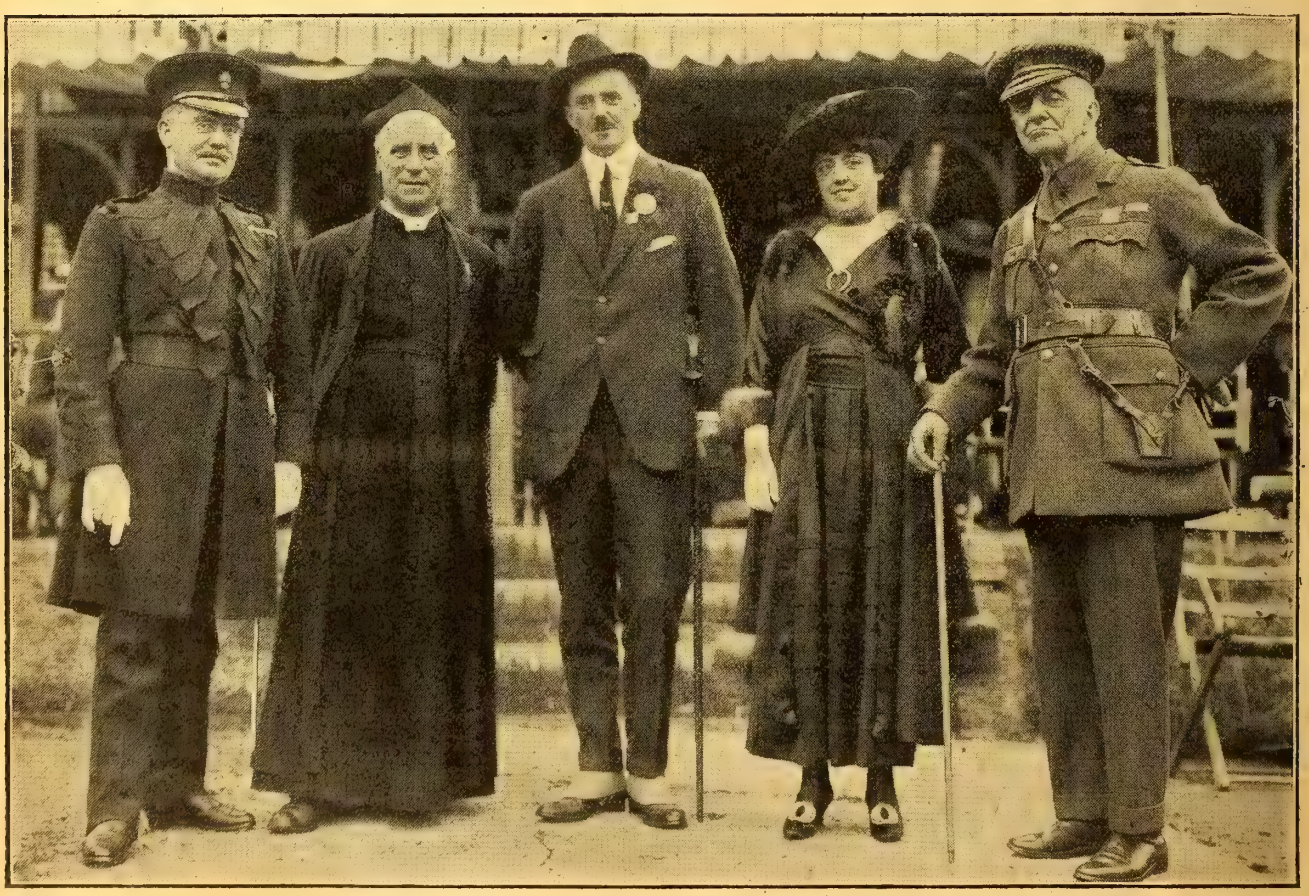
Tug of war (ladies).—Final : No. 1B team won by the opening two pulls.

120 yds. hurdle race (men).—Final : 1, T. Mann ; 2, W. Hammond ; 3, F. J. Heather.

One mile cycle race handicap.—1, A. Willis, scratch ; 2, T. Hayes, 18 yds. ; 3, L. Sheppard, 15 yds. Eight started.

100 yds. handicap (boys under 18).—Final : 1, Clarke ; 2, Muggeridge ; 3, Poulter.

100 yds., scratch (12 mile radius).—Final : 1, Green ; 2, Perrow ; 3, Forster.



AT THE WATNEY WORKERS' SPORTS.—Left to right, Captain Williams, M.V.O. (Bandmaster, Grenadier Guards), the Rev. Father Barry, St. George's College ; Major Gordon Watney, Mrs. Watney, General Alfred Turner.

100 yds. handicap (veterans).—Final: 1, Tribe; 2, Mills; 3, Hudston.

High Jump.—T. Mann won by clearing 4 ft. 4 ins., R. Taylor getting as near as 4 ft. 3 ins. Mann afterwards did 4 ft. 9 ins. in an exhibition jump.

Egg and spoon race (ladies).—1, Miss H. M. Moore; 2, Miss E. Mitchell; 3, Mrs. E. Nicholas.

Half-mile handicap (men).—1, W. G. Reeve, 20 yds.; 2, J. W. Nicholas, 35 yds.; 3, W. Hammond, 5 yds.

Slow cycle race (men).—Final: 1, Guttridge; 2, Brown; 3, Harris.

Long jump.—1, T. Mann, 15 ft. 4½ in.; 2, R. Taylor; 3, W. Munday.

80 yds. handicap (ladies).—1, Miss S. Witt, 3 yds.; 2, Miss R. M. Eve, 1 yd.; 3, Miss R. Hopkins. Won by a yard.

One mile handicap (open).—1, B. Muggeridge, 95 yds.; 2, J. Nicholas, 90 yds.; 3, C. F. Dunsden, 10 yds.

Sack race (men).—Final: 1, Collins; 2, Smeed; 3, Brown.

Sack race (ladies).—1, Miss R. Hopkins; 2, Miss W. Symonds.

Thread the needle race (for wounded soldiers and ladies).—1, Miss R. Hopkins and Pte Roberts; 2, Miss E. M. Kent and Pte. Cave.

Potato race (ladies).—Final: 1, Mrs. Nicholas; 2, Miss B. Hopkins; 3, Mrs. E. Illman.

Potato race (men).—1, T. Arras; 2, E. A. Turner; 3, T. Clark.

Slow cycle race (ladies).—Final: 1, Mrs. Illman; 2, Mrs. Nicholas; 3, Miss Tilley.

Quarter-mile handicap.—1, J. E. Forster, scratch; 2, W. J. Reeve, 13 yds.; 3, B. Muggeridge, 13 yds.

Tug of war.—The preliminary pulls had been contested prior to the sports, and the final rested with the Millwrights and the men of the Test Stands. The latter, with the benefit of sound coaching, won by scoring both first and second pulls.

Three miles cycle race handicap.—1, A. Willis, scratch; 2, N. Snow, 60 yds.; 3, J. Hayes, 60 yds.

Relay race.—1, No. 2 Shop (T. Mann, F. Guttridge, J. Hayes and A. Gerrish); 2, Beardmore Shop (B. Muggeridge, A. Roe, W. Hammond and J. Nicholas).

Major Watney's prize for best aggregate of points.—T. Mann.

Costumes (judged by a committee of lady guests).—Hired costumes: 1, Miss Stewart (Irish colleen); 2, Miss Cowie (Vivandiere). Home-made costumes: 1, Miss Garland (Indian Squaw); 2, Miss Hutt (Japanese).

A WORD TO THE WORKERS.

Lord Montagu of Beaulieu addressed workers at the Davidson Aviation Co., Ltd., on Sept. 12th. He said the work of everyone engaged in aeroplane construction was as important to the war almost as the actual fighting in the trenches. The future of aviation would depend upon the quantity and quality of the output we could attain during the next few months, and it was quite clear that unless there was a spirit of co-operation between masters and men and women we should not get either quantity or quality. If they thought, as some did, and as he hoped himself, that the war was going to be decided largely in the air next spring, or possibly before, they would realise that we must be supreme; that the number of our machines must exceed those of the enemy, and we must be in the position to replace wastage.

At the present moment the Germans had realised that, and he could tell them from information he had recently received that the Germans were putting forward every possible effort to increase their output. They had turned nearly all of the large number of workers who had hitherto been working on Zeppelin construction to the construction of aeroplanes.

How many thousands of extra workers that meant he did not know, but it was very considerable, and he had only learned that day from the representative of a distinguished French firm that in France they were of the same opinion, and that quantity and quality of output during this winter would be the most decisive factor in the war of next year.

"The Germans," continued Lord Montagu, "are doing something besides increasing output. They are practising very hard at flying by night. We all know what that is intended to lead to. Well, the only really effective remedy we have is not on this side, but on the other side. We must try and make their aerodromes impossible within flying distance of this country. We must bomb everything we can bomb from our lines in France. I know you will agree with me that we are not going to squeal if we have a few bomb raids in London. You will agree that, while we consider it the duty of the Government to protect the capital of the Empire and its citizens, and those great factories that are turning out aeroplanes and munitions of war, it would be foolish to deplete the front of first-rate squadrons in order to give a sense of false security here.

"Everyone knows that, as regards day raids, we must have efficient and up-to-date squadrons. That, I am ready to believe, has already been provided for, but as regards night raids, it is no good pretending that the work of keeping them off can be done on this side. Greatly as we deplore the casualties of these night raids, we must realise that we are part of the great National Army, that this is a war of nations, and not of select individuals—soldiers—gathered together in the Army.

"I see in some quarters there is a tendency to blame Lord French, Commander-in-Chief of the Home Forces. I am speaking unofficially when I say that I think that, with the limited number of men and amount of material at his disposal, Lord French has done all that it is possible to do. It is unfair to blame him for what occurred in the early stages of the war, when he had no guns and no 'planes to keep off raids."

Dealing with the future of aeronautics, Lord Montagu expressed the opinion that the air was going to be the great medium of communication not only between distant countries, but between England and her great outlying Dominions. In the past it had taken from 15 to 16 days to get from London to Bombay, but he could see no reason why the mail should not go out there in three days, or even less. A speedy communication of mails would mean that the number of letters would be doubled and trebled in business operations, he thought it possible that people would pay for letters to be sent by air mail at a much higher rate than postage, and that instead of spending many pounds in sending cables from London to India, which sometimes took 24 hours to reach their destination, they might have carried a letter containing, not 500, but 5,000 words for a shilling.

TALKING TO THE WORKERS.—The "hands" of the Davidson Aviation Co., Ltd., listening to Lord Montagu's inspiring speech.

THE PATENTS INDEX.

The subjoined list of recent inventions has been specially compiled by The Aeroplane from the current Official Patents Records.

Patent Applications.

Aeronautical Instrument Co. Balloons. No. 12942. Sept. 10th.
Aeronautical Instrument Co. Balloons. No. 13006. Sept. 11th.
Booth, Sir A. Flying-machines. No. 13064. Sept. 12th.
Brunton, J. D. Forming joints in streamline, etc., wires of aircraft. No. 13058. Sept. 12th.
Caproni, G. Chaser aeroplane. No. 13025. Sept. 11th.
Cleaver, H. C. Propellers for aircraft. No. 12921. Sept. 8th.
Diggle, S. Propellers and tractors for aerial or marine propulsion or traction. No. 13250. Sept. 15th.
Kelly, T. D. Aeronautical machines. No. 13210. Sept. 14th.
Langley, C. J. Aeroplanes. No. 13090. Sept. 12th.
Langley, C. J. Aeroplanes. No. 13197. Sept. 14th.
Leyland Motors, Ltd. Electric starting and ignition of aeroplane engines, etc. No. 12980. Sept. 10th.
Lucraft, G. E. Gliding airscrew. No. 13005. Sept. 11th.
McGruer, E. Hollow spars, wooden tubes, etc. No. 13089. Sept. 12th.
Martin, J. V. Aeroplanes. No. 13194. Sept. 14th.
Munday, A. W. Propellers for aeroplanes. No. 13171. Sept. 14th.
Oddy, W. D. Shaping-machines for shaping aircraft propeller blades, etc. No. 13254. Sept. 15th.
Phillips, H. W. Spars for aerial machines. No. 13249. Sept. 15th.
Prior, E. G., and W. Fuselages, wings, struts, etc., and manufacture thereof. No. 13127. Sept. 13th.
Vickers, Ltd. Aircraft gun mountings. No. 12978. Sept. 10th.
Wardman, C. B. Method of forming struts, etc. No. 12956. Sept. 10th.
Wells, J. K. Sighting-devices for use on aircraft. No. 13042. Sept. 11th.

Complete Specifications Accepted, Prints of which can be obtained on and after October 4th, 1917.

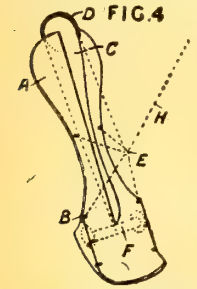
109,279. August 3rd, 1916. Savours, W. M. Structures such as temporary hangars for aircraft.
109,327. Sept. 29th, 1916. Brunessaux, A. H., and Iredale, G. Method of, and apparatus for, dropping bombs and the like from aerial craft.
109,335. Oct. 26th, 1916. Molesworth, H. B. Means for varying the speed of aeroplanes.
109,365. Dec. 21st, 1916. Aeronautical Instrument Co., and Brewer, G. Apparatus for recording or measuring differences in pressure between the gas contents of an aerostat and the external atmosphere.

Abridgments of recently published Specifications.

108,047. Sounding-apparatus. Money, G. J., 247, Dalston Lane, London.

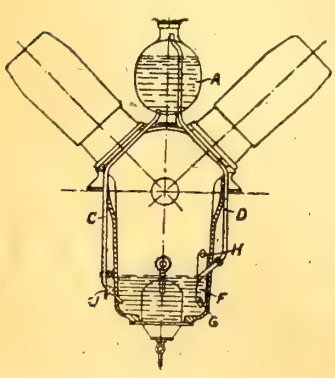
Sounding-apparatus for aircraft comprises a kite-shaped body suspended therefrom so arranged that when drawn through the air the pressure tends to force it downwards. Fig. 4 shows a form in which the kite-like body A having a web C for preventing side-ways motion carries a reel F of wire H. The wire H passes through the guide-tube D, through a wheel E attached to the body by wires passing through holes B, and from thence to the aeroplane. The sounding-apparatus may carry various attachments such as a light, bomb, or grappling-iron to enable a bomb to be dropped on an object which has been caught by the grappling-iron.

FIG.4



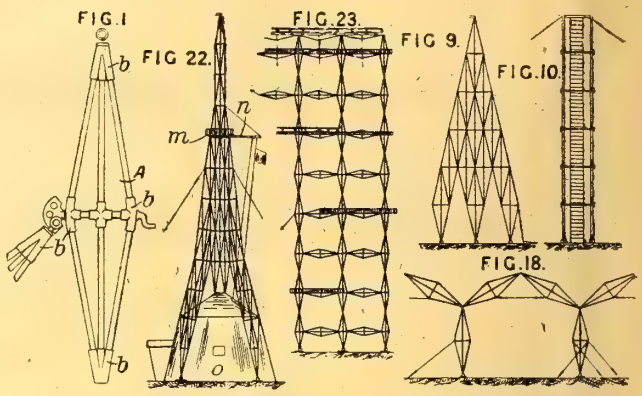
107,963. Lubricators. Soc. Lorraine des Anciens Etablissements de Dietrich and Cie de Luneville, 40, Rue du Colisée, Paris.

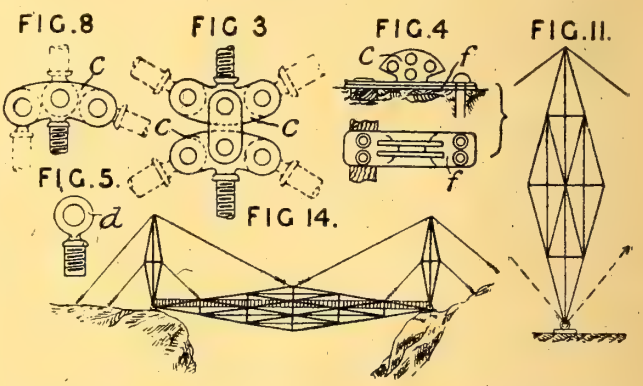
In a device for maintaining a constant level of oil in the crank chamber of an internal-combustion engine for aviation and other purposes, comprising an hermetically-sealed reservoir A connected to the crank chamber by oil and air pipes C, D, the lower end of the air pipe D terminates in a box F supported in the crank chamber, with which it communicates by small holes G, H at its lower and upper ends. By this means disturbance of the lubrication by inclination of the engine is minimised. The oil pipe C is fitted with a cock J.



107,765. Structures, building-elements for. Goiffon, P., 6, Nouvelles Maisons, Lyons, France. Convention date, June 15th, 1916. Not yet accepted. Abridged as open to inspection under Sect. 91 of the Act.

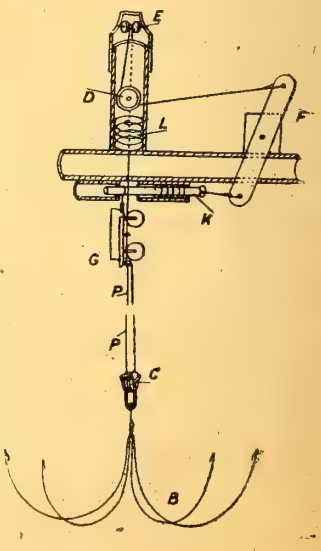
Structural work, either permanent or temporary, is formed of a number of similar lozenge-shaped elements A, Fig. 1, composed of steel tubes or bars or of bamboo, secured in three-way socket members *b*, the diagonals forming a cross. The elements are connected together by perforated members *c*, Figs. 3 and 8, and eyes *d*, Fig. 5, which are screwed into the members *b*. The elements are connected to the ground by shoes *f*, Fig. 4. The invention is applicable to the construction of an observation tower, either fixed as shown in Figs. 9 and 10, or movable, as shown in Fig. 11; bascule, suspension, trestle, foot, and other bridges of which Fig. 14 shows one example; sheds or hangars as shown in Fig. 18, or other large halls such as circuses, exhibitions, or theatres; posts for wireless telegraphy, Fig. 22, preferably composed of bamboo elements with a bridge *m*, platform *n*, and tents or shelter *o*; and scaffolding, Fig. 23, for monuments or other tall buildings. The element may be made in miniature as toys for building model structures, and may then be made of any metal.





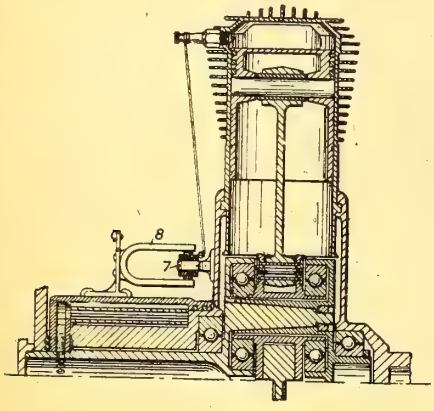
108,057. Delivering objects from aircraft. Badman, G., 4, Market Place, Coleford, Gloucestershire.

An aircraft is provided with means for delivering whilst in motion an object to another moving aircraft or to stationary objects, independently of their relative positions with respect to the vertical; for example, a bomb to an enemy aircraft or ground works, or mails or messages to friendly aircraft or ground stations. A grapnel, etc., B is hung by a pulley C in the loop of a cord P, one end of which is connected to a carrier G mounted to run on the cord on the other side of the loop, the carrier being normally supported by a spring-bolt K connected to a trigger-lever F, to which the other end of the cord P is connected after passing over the pulleys E, D. This side of the



cord is connected also to a spring L, to avoid shock. When the grapnel B engages another aircraft, etc., the pull on the cord P withdraws the bolt K and releases the carrier, which, by a continuation of the pull, is then drawn along the cord P to its objective.

FIG. I.



108,124. Internal-combustion engines. Murray, J. J., 42nd St., New York, U.S.A.

Igniting, in.—In an ignition arrangement for rotary-cylinder engines such as described in Specification 104,377, an armature 7 carried by each cylinder sweeps past a stationary field magnet 8. Each armature is connected to the corresponding spark-plug. The field magnet 8 may be adjusted for varying the time of sparking.

A RESIGNATION.

Mr. G. P. H. de Freville wishes it to be known that he no longer has any connection with the firm of Ware and de Freville, Ltd., having resigned from the Board of that Company so long ago as March last, in order to devote himself entirely to the Aluminium Alloy Pistons, Ltd., 8, Great Marlborough Street, W., of which firm he is managing director.

CONTINUITY OF ORDERS.

The following letter has been received:—

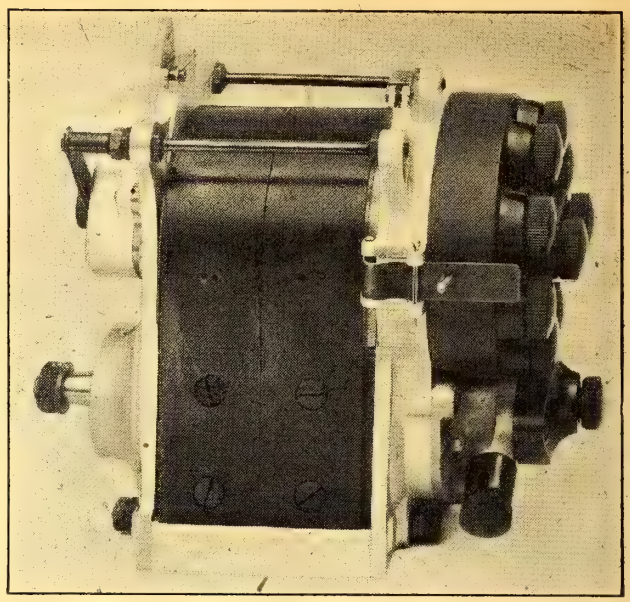
Sir,—Your report of Lord Montagu of Beaulieu opening Lady Drogheda's Air Service Exhibition at Sheffield on Sept. 7th contains an appeal to those engaged in aeroplane construction, not to let any domestic disputes hinder the output of aircraft.

Can you give the following the same publicity, so that manufacturers may be appealed to, and not the poor British workman, every time, who are all right?

At a large munition factory (Government controlled) in the Midlands, where a great number of men were engaged on aircraft work, production is almost at a standstill. The firm have just completed an order for fighting biplanes and have also received orders for another design of machine and should be producing them.

About two weeks ago something like forty men were discharged (not all of military age), and a week ago others commenced to take a holiday. This week, Saturday, Sept. 15th, a great many more are doing the same, to oblige.

We are not told we *must* take a holiday, but at the same time we are expected to, and to leave our address in case we may be wanted back earlier than expected.



Side View of the B.L.I.C., Type H.L.8.

I do not propose to point out what a loss of machines to the country, and time, etc., this means, when everybody who reads your valued paper is in close touch with aircraft work. What I wish to draw attention to is the slackness on somebody's part for not being able to keep up a continual flow of machines to keep men working who are experienced in aircraft production, instead of having a holiday in the hour of the country's greatest need, and being appealed to when others are to blame.

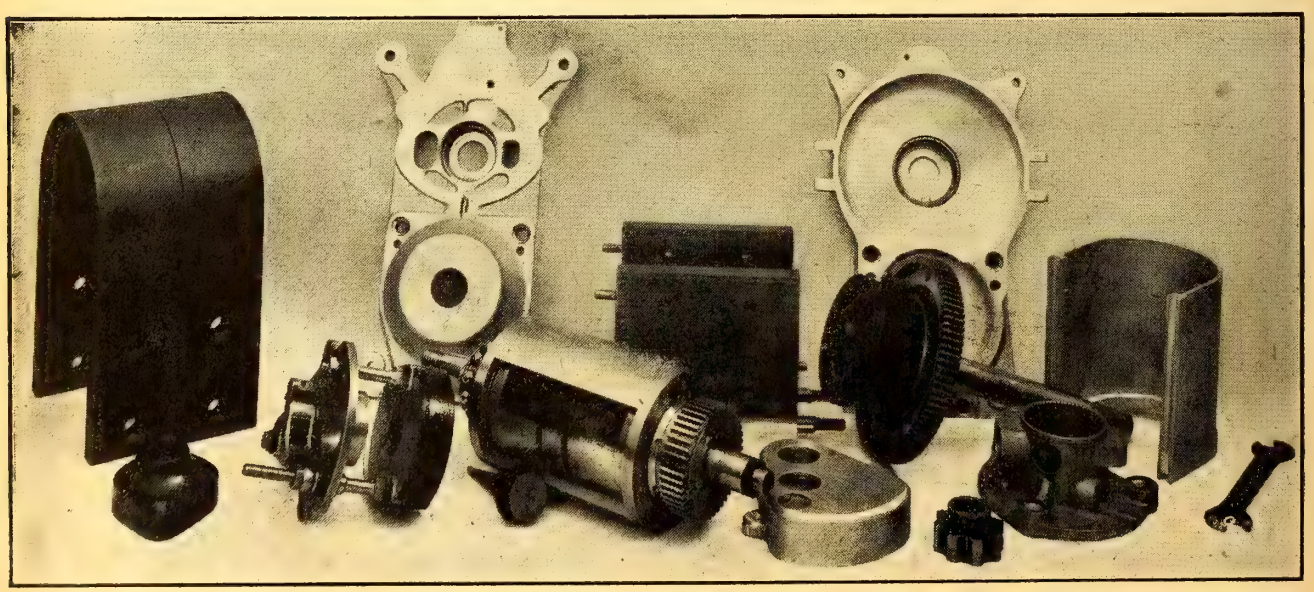
(Signed) Only an Employee.

THE B.L.I.C. MAGNETO.

The illustrations show photographs of a new "B.L.I.C." magneto, just produced for 8-cylinder engines, and manufactured by the British Lighting and Ignition Co., Ltd.

This magneto, which is known as the "B.L.I.C." H.L.8 type, is designed for use on high-speed multi-cylinder engines, and is not of the usual rotary armature type. In this new machine the winding is stationary, and an iron sleeve revolves between the armature core and the pole shoes. By this method it is possible to produce a magneto which gives four electrical impulses per revolution, as compared with two in machines whose armatures are rotated.

The advantages of this arrangement are obvious. The windings, being stationary, are not submitted to any centrifugal strains. The moving mass is reduced to a minimum, and, in addition, the magneto is capable of firing double the number of ignition points with the same speed and revolution. Not the least important feature is that it can be driven with gears running at much lower speeds.



BITS AND PIECES.—Component Parts of the B.L.I.C. Magneto, H.L.8 Type.

AIRCRAFT FINANCE

VOL I. No. 1. ISSUED AS A SUPPLEMENT TO "THE AEROPLANE"

AN INTRODUCTORY NOTE.

The great upheaval brought about as a direct consequence of the war in everything appertaining to Stock Exchange values, and finance generally, has led to many changes. One direct effect has been the creation of new elements of finance dealing with new commercial and industrial developments, with new methods as well as modified and altered regulations.

In this field of activity none have been of greater importance than the development of the aeroplane, at present as an important adjunct to military tactics, and in the future destined to play a most important rôle as a commercial factor and as a means of rapid transport. It is outside the realm of practical politics even to estimate the number of machines, pilots, engineers, and workmen at present engaged in all parts of the world in its manufacture. Much less is one able to compute the amount of capital actually invested and involved in the industry.

Astute and serious manufacturers, capitalists, engineers, and scientists are devoting time, money, and brains to this enterprise, as is evidenced by the number of important limited companies now interested in the manufacture of aeroplanes. From every point of view, satisfaction may be derived from the fact that the whole of this national wealth will go on multiplying and producing step by step as the aeroplane gradually but surely takes its allotted place in the sphere of national working economics.

As soon as hostilities cease, the day will not be far distant when competition, not only in manufacture, but in speed and cost of transport of passengers and goods, will be a matter of international rivalry and competition, and the securities of aeroplane companies must eventually rank in the same category of investment as shipping, railway, omnibus, and kindred companies of national importance, as reliable and sound dividend producers. It will be my aim, week by week, to give information on all matters connected with aeroplane finance and to deal in these columns with all subjects affecting the finance of the industry.

The Treasury and New Issues.

The Treasury regulations affecting new issues of capital to a young industry such as that of aeroplane manufacture is more particularly interesting than to any other class of commercial enterprise, and the official notice circulated recently by the Press Bureau for publication is of vital importance to promoters, directors, and other officials contemplating the incorporation of and the issue of capital for and on behalf of aeroplane companies.

The official notice issued is as follows:—

> "It has come to the knowledge of the Lords Commissioners of the Treasury that offers of underwriting and of participation in new issues have recently been made before the conditions of Regulation 4 (3) of the Temporary Regulations for the reopening of the Stock Exchange have been complied with. Their Lordships desire to inform all persons and houses who transact business in stocks, shares, bonds, or other securities, and all corporations and companies who may wish to issue the same, that the provisions of this Regulation forbid underwriting and the offer of participation in new issues until permission for dealings has been duly given. His Majesty's Government are considering in consultation with the Allied Governments what steps would be taken to deal with the problem when the existing restrictions come to be removed."

Notwithstanding these restrictions, the incorporation of new companies with important capitals continue to be registered, clearly indicating that the Treasury regulations are ineffective, and that companies are formed and subscriptions to capital obtained privately. In actual practice the only effect is that these securities are refused official recognition or quotation on the Stock Exchange.

The notice just issued by the Lords Commissioners of the Treasury is scarcely likely to bring about any alteration in the position. The wording of the regulations themselves is ambiguous, and, if punitive measures are to follow, they should be clearly indicated. The New Issues Committee will have to revise their own policy, and bring about some amelioration in their system of giving decisions if Treasury regulations are to be observed and enforced.

Two important factors should be adopted by the Committee, and acted upon without fear or favour. The first essential should be that no issue be sanctioned which on the face of the proposal is not unquestionably a sound proposition. The Committee cannot, of course, act as guarantors for investors, but the experts of the department are well able to differentiate between sound business, a fair risk, and a "wild-cat" scheme.

The second essential should be that no company, however sound the proposal, should receive Treasury sanction unless it be engaged upon Government work.

It is the clear duty of the Committee to encourage and do all in its power to develop the incorporation of aeroplane companies, for the reason that the growth of the industry is destined to become of the greatest national benefit. If the Treasury would legislate along these lines, it would be rendering a great service, not only to those interested in aeroplane finance, but to the nation and the financial world generally.

DIVIDEND DECLARATIONS.

Sir W. G. Armstrong, Whitworth & Co., Ltd.

An interim dividend on the ordinary shares of this company has just been declared at the rate of 10 per cent. per annum (tax free) for the half-year to June 30th last.

The company in its present form and under its present title dates from January 1st, 1897, though the

original foundation under the Limited Companies Acts dates from 1882.

The present authorised capital is £7,012,500, divided into £1,000,000 4 per cent. Cumulative Preference shares of £5 each, £2,000,000 5 per cent. Second non-Cumulative Preference shares of £1 each, and £4,012,500 Ordinary shares of £1 each. These securities are dealt in on the Stock Exchange. The Accounts are made up to December 31st in each year.

Birmingham Small Arms Company, Ltd.

The directors of the Birmingham Small Arms Company recommend the following final dividends for the year ended July last, payable on 12th proximo :—On the "A" Preference shares at the rate of 5 per cent. (less tax); on the "B" Preference shares at the rate of 6 per cent. (less tax); and on the Ordinary shares at the rate of 5 per cent., together with a bonus of 2s. per share free of tax. These dividends are the same as those paid last year.

A Recent Registration.

The Whitehead Aircraft (1917), Ltd., just registered, has been formed with a nominal capital of £1,000,000, divided into 300,000 Preference and 650,000 Ordinary shares of £1 each, and 1,000,000 Deferred Ordinary shares of 1s. each, to take over (inter alia) the business carried on at Richmond, Surrey, by Whitehead Aircraft, Ltd., to manufacture, buy, sell, prepare, let on hire, and deal in aerial conveyances and aircraft of all kinds, and the component parts thereof. Up to date of publication no further information has been issued.—G. A.

CURRENT QUOTATIONS.

The following are the current quotations made up to Tuesday morning in each week of the principal companies engaged in the Aircraft Industry and Kindred Trades.

Aircraft Mnfg. Co. 7% cum. pref. £1 ...	23 -	24/-
Armstrong (Sir W. G.) Whitworth & Co., Ltd. 4% cum. pref. £5...	37/16	39/16
Armstrong (Sir W. G.) Whitworth & Co., Ltd. 5% 2nd. pref. £1 ...	17/6	18/6
Armstrong (Sir W. G.) Whitworth & Co., Ltd. £1 ordinary	40/-	41/-
Austin Motor Co., Ltd. 7% cum. pref. £1...	18/-	19/-
Austin Motor Co., Ltd. £1 ordinary	23/-	24/-
Birmingham Small Arms Co., Ltd. £1 ordinary	54/6	55/6
Birmingham Small Arms Co., Ltd. 5% cum. "A" pref.	4¼	4¾
Birmingham Small Arms Co., Ltd. 5% cum. "B" pref.	19/6	20/6
Boulton & Paul, Ltd., 5% cum. pref. £1	⅞	1
Brown Bros., Ltd., 6% cum. pref. £5...	4½	4¾
Darracq (A) & Co., (1905) Ltd. £1 ordinary ...	33/6	34/6
Darracq (A) & Co., (1905) Ltd. 7% cum. pref. £1...	22/6	23/6
Electric Construction Co., Ltd. 7% cum. pref. £1...	⅞	1
Electric Construction Co., Ltd. £1 ordinary	⅞	1
Fellows Magneto Co., 8% cum. partip. pref.	17/-	18/-
General Electric Co., Ltd. 6% cum. pref. £10 ...	10	10⅜
General Electric Co., Ltd. £10 ordinary	17	18
Gwynnes, Ltd., 5% cum. pref.	91/-	92/-
Gwynnes, Ltd., Ordinary	8/3	8/6
Greenwood & Batley, Ltd., £10 ordinary	9	10
Humber, Ltd., 6% cum. pref. £1	17 6	18 6
Humber, Ltd., £1 ordinary	17/3	18/3
Napier (D) & Son, Ltd., 7½% cum. pf. £1	17/9	18/3
Peter Hooker, Ltd., £1 ordinary	21/-	22/-
Rolls Royce, Ltd., £1 ordinary	59/-	60/-
Rudge Whitworth, Ltd. £1 ordinary ...	41/-	42/-
Ruston, Proctor & Co., Ltd. £1 ordinary	26/-	27/-
Ruston, Proctor & Co., Ltd. 5% cum. pref. £1 ...	17/-	17/6
Sunbeam Motor Car Co., Ltd., £1 ord...	86/-	87/-
Straker Squire, Ltd. (1913), £1 ordinary	24/-	24/6
S. Smith & Son, Ltd. (Motor Accessories) £1 ordinary	26/6	27 6
Triplex Safety Glass, £1 ordinary... ...	17/-	18/-
Vickers, Ltd., 5% pref. stock...	78	82
Vickers, Ltd., 5% pref. shares. £1 ...	18/6	19/-
Vickers, Ltd., £1 ordinary	39/-	40 -
Wm. Beardmore & Co., Ltd., 6% c. pf. £1	19/-	19,6

September 25, 1917.

GENERAL INFORMATION.

Armstrong, Whitworth (1916).
Austin Motor (1916).
Rolls Royce.
Rudge Whitworth.
Straker-Squire (1915).
Sunbeam Motor.
Thorneycroft (J. I.) & Co.
Vickers (1915 and 1916).

Owing to the difficulty of estimating liabilities under Finance and Munitions Acts, the accounts will not be ready until a later date.

APPOINTMENTS AT BOULTON AND PAUL'S.

The "B.P." magazine, house journal of Boulton and Paul, Ltd., Norwich, records in its August-September issue, several changes upon its directorate and staff.

Mr. Henry Fiske has retired from the position of managing director after 50 years' work with the firm. He has, however, been elected a life director.

Captain J. D. Paul has been re-elected to the board as chairman, and Mr. Stanley Howes has been made a director of the firm.

Mr. J. D. North's appointment as chief of the technical department has already been recorded in The Aeroplane.

Mr. M. A. S. Riach has joined the firm as chief theoretical assistant.

Mr. Edouard Boudot, from the North British Diesel Engine Works, Ltd., is now chief of the buying department.

A RESIGNATION.

It should be noted that Mr. Robert P. Grimmer is now no longer connected with the Aircraft Construction Company. Mr. Grimer is willing to accept any position in the Aircraft Industry which will afford the proper utilisation of his previous experience with aeroplane designing and construction.

Reprinted from "Flugsport."

A Bristol Fighting Two-seater, with gun-ring at the back, built by the British and Colonial Aeroplane Co., Ltd.

(*Continued from Page 874.*)

WOUNDED.—Collett, Capt. C. F., M.C., R.F.C.
Weightman, Sec. Lt. H., R.F.C.
West Thompson, Sec. Lt. M., R.F.C
MISSING.—Diamond, Sec. Lt. W. E. de B., R.F.C.
Saward, Lt. N. C., R.F.A., attd. R.F.C.
Sayers, Sec. Lt. K. R., R.W. Kent R., attd. R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Hudson, Capt. F. N., M.C., Buffs, attd. R.F.C.
Wilkins, Capt. H. O. D., Bedf. R., attd. R.F.C.
INDIAN FORCE.—WOUNDED.—Thomson-Glover, Capt. J. W., I.A., Inf., attd. R.F.C.
AUSTRALIAN FORCE.—DIED.—Freadman, Lt. Z. E., Aust. Fl. C. Reported Sept 22nd.
PREVIOUSLY REPORTED WOUNDED, NOW REPORTED DIED OF WOUNDS.—Treadwell, Lt. R. N., R.F.C.
WOUNDED.—Yorke, Lt. F., Ches. R., attd. R.F.C.
MISSING.—McMaking, Lt. O. L., Yeo., attd. R.F.C.
Pearson, Sec. Lt. O. C., R.F.C.
Robertson, Sec. Lt. G. P., R.F.C.
Sisley, Sec. Lt. A. J. S., R.F.C.
Reported Sept. 24th.
KILLED.—Smith, Sec. Lt. H. C., R.F.C.
Wear, Sec. Lt. A. E., R.F.C.
DIED OF WOUNDS.—Budd, Sec. Lt. E. F. C., R.E., attd. R.F.C.
WOUNDED.—Halley, Sec. Lt. C. R. B., R.F.C.
Light, Sec. Lt. A. D., R.F.C.
McKechnie, Capt. W. G. B., R. Sco. Fus., attd. R.F.C.
Milne, Capt. J. T., M.C., R.F.C.
Waddell, Sec. Lt. L. N., R.F.C.
MISSING.—Batson, Sec. Lt. H. T., R W. Surr. R., attd. R.F.C.
Denison, Sec. Lt. E. B., R.F.C.
Halliwell, Sec. Lt. J. A., R.F.C.
Hearn, Sec. Lt. E. T. H., R.F.A., attd. R.F.C.
Jenkin, Capt. L. F., M.C., R.F.C
MacKay, Sec. Lt. J. A., R.F.C.
Mansell, Sec. Lt. W. S., E. Surr. R., attd. R.F.C.
Streather, Sec. Lt. E. H. P., R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Davis, Sec. Lt. G., R.F.A. and R.F.C.
Reported Sept. 25th.
WOUNDED.—Gammon, Lt. H. W., R.F.C.
Stedman, Sec. Lt. R. de L., R.F.C.
MISSING.—Dronsfield, Sec. Lt. S. W., R.F.C.
PREVIOUSLY REPORTED PRISONERS, NOW REPORTED WOUNDED AND PRISONERS IN GERMAN HANDS.—Don, Capt. F. P., Yeo., attd. R.F.C.
Murray, Lt. D. C. G., R.E., attd. R.F.C.
CANADIAN FORCES.—PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Chalk, Lt. W. J., Man. R., attd. R.F.C.
Godwin, Lt. T. E., Gen. List, attd. R.F.C.
ACCIDENTALLY KILLED.—Legere, Lt. A. A., Can. Forestry Corps, attd. R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED.—MacFarlane, Lt. J. L., B.C. Regt., attd. R.F.C.
MacRae, Lt. D. J., Alta. Regt., attd. R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Hutcheson, Lt. W. B., Can. Eng., attd. R.F.C.
Malloch, Lt. C., E. Ont. Regt., attd. R.F.C.

* * *

CASUALTIES AMONG WARRANT OFFICERS, N.C.O.'S AND MEN. THE DATES ARE THOSE OF THE OFFICIAL LIST.

KILLED.

SEPT. 10th.—R.F.C.—Browning 10814 1st Cl. Air Mech. C. F. (Aldershot).
SEPT. 11th.—R.F.A., attd. R.F.C.—Lawson 690066 Driver A. (Liverpool).
SEPT. 13th.—Jones 3349 1st Cl. Air Mech. A. M. (Heaton Norris); Metcalfe 52645 3rd Cl. Air Mech. J. G. (Sleaford).
SEPT. 14th.—Winstone 44354 2nd Cl. Air Mech. A. E. (Oxford). MANCHESTER REGT., attd. R.F.C.—Pilbrow 44340 S. E. (Chelsea, S.W.).
SEPT. 15th.—Fairless 6728 2nd Cl. Air Mech. R. L. (St. Helens); Walker 4969 1st Cl. Air Mech. G. S. (Mosside).

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.

SEPT. 14th.—R.F.C.—Webb 191 Flt. Sgt. W. C. (Kilburn, N.W.).

DIED OF WOUNDS.

SEPT. 14th.—R.F.C.—Rowe 9038 2nd Cl. Air Mech. F. L. (Acton, W.).

ACCIDENTALLY KILLED.

SEPT. 15th.—R.F.C.—Castell 39594 1st Cl. Air Mech. G. C. (Honor Oak Park, S.E.); Newman 13210 Cpl. A. B. (Leicester).

DIED.

SEPT. 10th.—R.F.C.—Chapman 30441 2nd Cl. Air Mech. J. V. (Bradford, Yorks).

WOUNDED.

SEPT. 13th.—R.F.C.—Bates 13411 2nd Cl. Air Mech. F. W. (Kentish Town, N.W.); Goffe 77335 Cpl. C. R. (Hook); Liddiard 10026 2nd Cl. Air Mech. E. W. (Bayswater, W.).
SEPT. 14th.—Breare 43690 2nd Cl. Air Mech. A. (Barley-in-Wharfedale); Cooper 63754 2nd Cl. Air Mech. G. C. E. Leytonstone, E.); Lambert 5081 1st Cl. Air Mech. R. (Liverpool); Perrott P9273 2nd Cl. Air Mech. E. (Guernsey); Scott 43673 2nd Cl. Air Mech. R. (Greenwich, S.E.).
SEPT. 15th.—Atkins 5703 1st Cl. Air Mech. G. F. (Camberwell, S.E.); Fisher 56634 2nd Cl. Air Mech. B. C. (Llantwit-Major); Keene 11363 2nd Cl. Air Mech. J. J. (East Ham, E.); McKillop 65054 2nd Cl. Air Mech. J. (Glasgow).

PREVIOUSLY REPORTED MISSING, NOW REPORTED MISSING, BELIEVED KILLED.

SEPT. 13th.—R.F.C.—Wickham 27234 Actg. Sgt. W. S. (Norwich).

MISSING.

SEPT. 13th.—R.F.C.—Addison 88163 2nd Cl. Air Mech. W. (Darlington).
SEPT. 14th.—Bessenger 23052 Cpl. H. G. (Plaistow, E.); Comerford 1166 Sgt. C. J. (Gillingham).
SEPT. 15th.—Kelly 87597 2nd Cl. Air Mech. E. (Galway); Smith 78930 2nd Cl. Air Mech. F. J. (Hornsey, N.).

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS OF WAR.

SEPT. 11th.—R.F.C.—Bemister 78530 2nd Cl. Air Mech. C. (Fredricton, Newfoundland).
BLACK WATCH, attd. R.F.C.—Mollison 8953 Sgt. W. (Monifieth).

PREVIOUSLY REPORTED BELIEVED TAKEN PRISONER AT KUT-EL-AMARA, NOW REPORTED PRISONER OF WAR IN TURKISH HANDS.

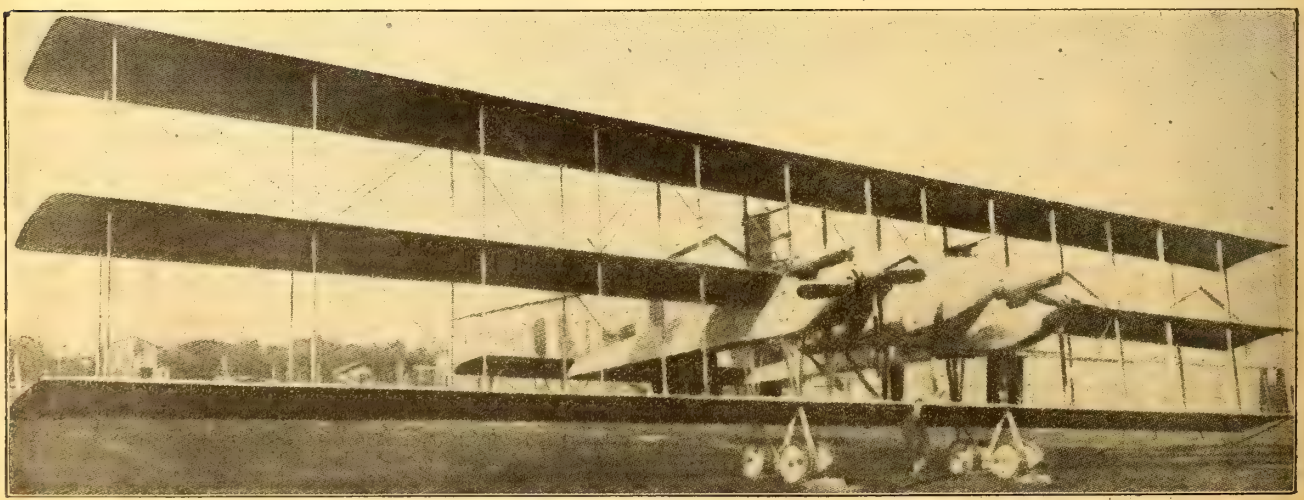
SEPT. 15th.—R.F.C.—Claridge 1299 1st Cl. Air Mech. L. V. (Walsall).

PERSONAL NOTICES.

DEATHS.

BATTERSBY.—Lieut. P. W. Battersby, Yeomanry, attd. R.F.C., who was reported missing on July 7th, and is now believed to have been killed on that date, was the fourth and youngest son of the late Worsley Battersby, of Knowle, Dunster, and of Mrs. Battersby. He is 28 years of age.

BRACEY.—2nd Lieut. Victor Charles Edelsten Bracey, R.F.C., who was killed while flying on September 23rd, was the only



A CAPRONI TRIPLANE.—A colossal 600-h.p. Bomber, and probably the largest machine in Italy.

child of hon. Lieut. William Edelsten Bracey, R.A.M.C., and Mrs. Bracey, Wedmore, Somerset. He was 19 years of age, and at the inquest on September 24th a verdict of accidental death was returned.

FITZHERBERT.—Capt. Wyndham Waterhouse Fitzherbert, Royal Sussex Regt., attd. R.F.C., who was killed on July 7th, aged 25, was the third son of the late W. A. Fitzherbert, Marsden, The Hut, Wellington, New Zealand, and Mrs. Fitzherbert, and grandson of the late Sir William Fitzherbert, K.C.M.G. He was born in New Zealand and educated at Huntley School, Marton, Wanganui College, and afterwards at Marlborough College, England. He returned to New Zealand, and afterwards went to the Argentine to take up farming.

When war broke out he (and his youngest brother, who was killed on July 30th, 1916) came over from the Argentine and enlisted in the 12th Royal Sussex Regt., but shortly afterwards was given a commission in another battalion of that regiment. While in training, before going to France, he passed a musketry course and a machine-gun course with distinction. He went otu to France in March, 1916, and was twice wounded, the second time in June of that year, when he returned to England to hospital.

In December he rejoined his regiment at the front, and was there till the following May, when he joined the R.F.C., and went back to the front in June. He was killed when returning from a long-distance bombing raid.

GODWIN.—Lieut. Thomas Ernest Godwin, Canadian Army, attd. R.F.C., was killed in an air fight on August 21st. He was 24 years of age.

HARGRAVE.—"Death from misadventure" was the verdict returned on September 24th at the inquest on 2nd Lieut. Ernest Hargrave, R.F.C., aged 18, who lost his life as the result of a flying accident during the week-end.

HAWES.—Sec. Lt. Frederick Maxwell Hawes, R.G.A., attchd. R.F.C., second son of the Rev. F. W. Hawes and Mrs. Hawes, of Stapleford Vicarage, Cambridge, who lost his life in an aeroplane accident on September 14th, was born in 1899, and educated at Marlborough College, of which he was a foundation scholar. He went to the Royal Military Academy, Woolwich, in June, 1916, and was gazetted 2nd lieutenant, R.G.A., last February. In the following April he became attached to the R.F.C., in which he soon qualified as pilot, though only 18 years of age.

His O.C. writes of him:—"He was one of the best and keenest pilots I have had, and promised to be quite brilliant." The inquest was held on Monday, September 17th, when it was stated in evidence that the officer was "stunting" at a height of 5,000 ft. He had performed a "loop," and was in the act of beginning another, when a loud crack was heard, and one of the wings was seen to give way. The machine, with its pilot, fell into a large pond, where it was submerged. The jury returned a verdict of "Death by misadventure."

HOBART-HAMPDEN.—Lt. George Miles Awdry Hobart-Hampden, Oxford and Bucks Light Infantry, attd. R.F.C. (killed while flying on Sept. 17th), was 21 years of age. He had his infantry commission in June, 1915, and was promoted in September, 1916; he was gazetted flying officer in December, 1916.

HOFMEYR.—Lt. Richard Hofmeyr, King's Own Yorkshire Light Infantry, attd. R.F.C. (died on hospital ship at sea in the East on September 11th), was twenty-four years of age. He had his commission in the K.O.Y.L.I. in August, 1915, and was attached R.F.C. in August 1916; he was appointed temporary lieutenant in May this year.

HUNT. Mr. E. W. A. Hunt, R.F.C., who was reported missing on May 1st, and is now reported killed on that day, was the eldest son of the late Edward Hunt, C.E., and of S. I. Hunt, of Sidcup. He was 24 years of age.

JENNINGS.—Capt. Alex. Jennings, R.A., Flight Commander, R.F.C., reported missing on April 7th last, is now known to have been killed in aerial fighting on that day. Born in 1894, he was the only son of Mr. and Mrs. W. J. Jennings, of Kennington Hall, near Ashford, Kent, and was educated at Yardley Court, Tonbridge, Tonbridge School, and at Zurich, being at Zurich when war broke out. At the earliest opportunity he returned home, and entered the Royal Military Academy, Woolwich, in December, 1914, passing out in July, 1915, and being posted to a battery of the Royal Horse Artillery. Shortly after obtaining his commission, he was sent to Gallipoli, where he was slightly wounded. He was invalided to Alexandria with a severe attack of typhoid shortly before the evacuation.

He returned to England early in 1916, and while on sick leave obtained the Royal Aero Club's qualification for flying, with the intention of immediately joining the Royal Flying Corps. In May, however, he was sent to a battery at the front, and served with it until he was attached to the R.F.C. in July, when he returned home to train. He obtained his wings in October, and proceeded at once to a squadron at the front.

LENNARD.—Sec. Lt. E. S. R. Lennard, R.F.C., who was killed in action on Sept. 14th, was the youngest son of Mr. and Mrs. F. Lennard, 23, Adelaide Crescent, Hove. He was 19 years of age.

MAITLAND.—Arthur James Maitland, who was killed in a flying accident at Croydon on the 22nd September, was the youngest son of Mr. and Mrs. John Maitland, of Blythwood, Enfield. He was 18 years of age.

MARSHALL-LEWIS.—Sec. Lt. Frank Marshall-Lewis, Royal Warwickshire Regt. and R.F.C., who was killed whilst flying at the front on the 13th inst., was the son of Mrs. Harry Lewis and stepson of Mr. Harry Lewis, of 9, Norland Square, Holland Park, W.11. He was educated at Clephanes College, Great Portland Street, and was in his 20th year. Joining the Civil Service Rifles in November, 1914, he obtained his commission in June, 1915. He had been on active service in France since August 16th, 1916, and saw much fighting. Joining the R.F.C. last March, he went to the front as an observer in the following May. On the day he met his death an eye-witness who was in the trenches writes: "Nothing more wonderful than your son's coolness and courage under terrific anti-aircraft fire could possibly be imagined, and it was the opinion of the commander of the division and of everyone else present that a more daring operation had never been carried out by our flying men."

NUNN.—Lieut. Nunn, R.F.C., was killed at Dartford on September 24th through his aeroplane nose-diving and crashing to earth. The observer, who jumped from the aeroplane, was seriously injured.

PALMER.—Sec. Lt. William Samuel Hudson Palmer, R.F.C., whose death was announced last week, was the only son of Councillor Palmer, of Dalkeith, Latchmere Road, Kingston-on-Thames, and was in his 21st year. He was educated at Hampton Grammar School and Finsbury College, where he gained his qualifying certificate as an electrical engineer. He enlisted as soon as he was 18 years of age in the Artists Rifles, and served in France for some time before receiving his commission in the Royal Flying Corps.

RICKARDS.—Capt. Arthur Traherne Rickards, R.G.A., attd. R.F.C., who was killed on September 13th, aged 24, was the only son of Mr. and Mrs. F. T. Rickards, of 25, Corfton Road, Ealing. He was born in Bombay in 1892, and was educated at Marlborough College and the Central Technical College, Kensington, finishing his engineering training at the McGill University, Montreal. On the outbreak of war he volunteered for service, and returning to England entered Woolwich, and received his commission in the R.G.A. on April 22nd, 1915. Shortly afterwards he proceeded to the front. In January, 1916, he was appointed observer for artillery in the R.F.C., which post he held till the following October, when he returned to England to train as a pilot. He was mentioned in dispatches on November 13th, 1916. He obtained his wings in April, 1917, and returned to the front in May. On July 12th he was promoted captain and flight commander, R.F.C.

His squadron commander writes:—"In the great loss to you our own loss may appear dwarfed, but I assure you that not a man in the squadron but held your son in the highest esteem, and will mourn with you in his passing. To me his gallant death has been a great blow. For two months he had held the post of flight commander with the greatest success, and whilst I was on leave recently he commanded with his usual success. His fine flying was a noble example to others, and I have no hesitation in saying, as I have said to others during his lifetime, that no finer pilot or better fellow ever came to the front. His skill in flying, his head so packed with wisdom, his quiet personality, make me mourn the ill-chance of a stray shell that brought him low, for no Hun that ever took the air would have been a match for him. His part, a fine one, is played."

WATLINGTON.—Sec. Lieut. Henry Joseph Watlington, R.F.C., who was reported missing on July 6th, and is now unofficially reported killed on that date, while engaged on a photographic reconnaissance, was the eldest son of Mr. Henry William Watlington, M.C.P., and Mrs. Watlington, of Bermuda, and was 21 years of age. He was educated at Upper Canada College, Toronto. He enlisted in the Bermuda Volunteer Rifle Corps in September, 1914, and was twice wounded while serving with them in France in 1915. After five months in hospital in England he trained for a commission in the Royal Flying Corps, and was gazetted last March. His commanding officer writes:—"I cannot say how sorry I am to have lost an officer who, although he had been here a very short time, had gained the affection and respect of the squadron and given certain promise of being a brave and useful flying officer." He was married in July, 1916, to Isabel, daughter of Mr. Harrington Emerson and Mrs. Emerson, of New York.

WEAR.—Sec. Lt. Albert Wear, R.F.C., who has been killed in action, was the son of Mr. F. E. Wear, of Middleton Road, Bowes Park, N. After being educated at the Stationers' School, he entered the office of a chartered accountant, and joined the Royal Fusiliers soon after war was declared. After service in France he volunteered for the Royal Flying Corps, and was accepted. He was killed last week whilst returning from a flight over the enemy lines.

WORKMAN.—Lt. Charles Service Workman, M.C., Cameronians and R.F.C., who died of wounds received in action on July 20th, was the younger son of Charles Workman, M.D., 5, Woodside Terrace, Glasgow. He was 20 years of age.

Engagements.

EASTWOOD—BESTIC.—The engagement is announced of Lieut. R. Eastwood, the Essex Regiment, attached R.F.C., and Florence, only daughter of Lieut. Bestic, R.N.V.R., late of Sydney, Australia. The marriage will take place at an early date.

GOSSAGE—O'BRIEN.—The marriage arranged between Major Ernest Leslie Gossage, M.C., R.F.A. and R.F.C., eldest son of Colonel Gossage, V.D., and Mrs. Gossage, of Darincourt, Uptonheath, Cheshire, and Eileen Gladys, daughter of Brigadier-General O'Brien, C.B., and Mrs. O'Brien, of Buxted Rectory, Buxted, Sussex, will take place on October 5th at the parish church, Buxted, at 2.30.

HALL—WELLS-COLE.—The marriage of Capt. G. H. Hall, R.F.C., and Miss M. G. Wells-Cole will take place quietly at Lincoln on October 1st, leave permitting. No invitations will be sent, but friends and relations will be welcome at the church.

KNIGHT-BRUCE—AVELING.—The marriage has been arranged, and will take place quietly at St. Stephen's Church, Gloucester Road, S.W., on Saturday, October 6th, at 2.30, between Capt. R. E. C. Knight-Bruce, Royal Devon Yeomanry and R.F.C., of The Sanctuary, Crediton, Devon, and Evelyn, elder daughter of Mr. Neville Aveling and of Mrs. Neville Aveling, of St. Germans Hall, Norfolk. All friends will be welcome at the church.

Marriages.

ANNANDALE—CALDWELL.—The marriage of Mr. Arthur James Annandale, R.F.C., son of the late Mr. James Hunter Annandale, of Polton, Mid Lothian, and Miss Theodora Lindsay Caldwell, daughter of Colonel and Mrs. Caldwell, of York, on Sept. 18th, at South Ascot Parish Church, was attended by a congregation in which the Royal Flying Corps was largely represented, both by officers and men. The service, conducted by the Rev. F. J. Evans, C.F., was choral, the hymn, psalm, and sentences being sung by the Aircraft Concert Party, which formed the choir. Air Mech. Drake, the youngest Fellow of the Royal College of Organists, was at the organ, and Air Mech. Bailey sang Sydney Smith's "Ave Verum." The bride was given away by her father.

HAWKER—KNOX.—On Sept. 18th, at the Parish Church, Crossmolina, Co. Mayo, Capt. Trevor McDonnell Hawker, Royal Irish Fusiliers and R.F.C., elder son of Walter Hawker, of Anama, Clare, South Australia, and "Derrymore," Mount Lofty, Adelaide, was married to Elsie Knox, elder daughter of Ernest Henry Knox, of Greenwood Park, Crossmolina, by the Rev. A. I. Pike, M.A., Rector, assisted by the Very Rev. the Dean of Killala, and the Rev. J. F. Nash, B.A.

HAYNES—WALKER.—On Sept. 18th, at the Church of the Annunciation, Hyde Park, Capt. Charles C. Haynes, Devon. Regt., R.F.C., son of Col. C. E. Haynes, C.B., R.E., "Kerries," Brent, Devon., was married to Sheelah, daughter of the late Lt.-Col. G. Lemon Walker, I.M.S., and Mrs. Walker, Jersey, C.I., by the Rev. R. V. G. Shaw, Vicar of St. Paul's, Langlebury, assisted by the Lord Bishop of Buckingham, cousins of the bride.

Births.

ALLEN.—On Sept. 18th, at 8, Oaklands Road, Bedford, the wife of the late Lt. Melville R. Allen, R.F.C., a son.

BILLINGHURST.—On Sept. 11th, at Stedham, West Byfleet, to Lieut. R. W. B. Billinghurst, R.F.C., and Mrs. Billinghurst—a daughter.

BUCKERIDGE.—On Sept. 10th, at 10, Silverdale Road, Hove, to Major and Mrs. Norman Buckeridge, R.F.C., a son.

COLLENETTE.—On the 20th inst., at "Summerhill," Hill Top Road, Oxford, the wife of Capt. F. de B. Collenette, R.F.C., of a son.

STONE.—On the 21st inst., at Quinbury, Braughing, Herts, the wife of Lt. S. S. Stone, R.F.C., of a son.

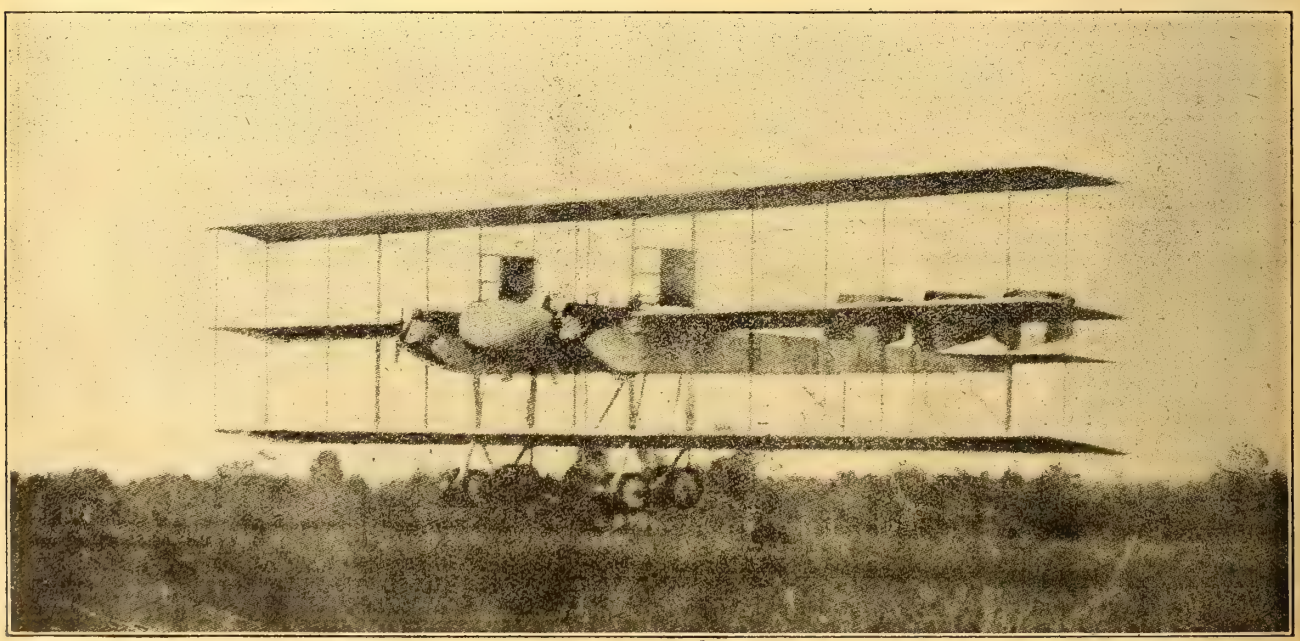
Sir Bryan and Lady Leighton have received unofficial news that their son, Captain R. T. Leighton, Yeomanry and R.F.C., who was reported missing on August 17th, is lying wounded in a base hospital in the German lines. Captain R. T. Leighton, who received his commission on leaving Eton in 1911, had served eighteen months in France with his regiment, and was seconded to the R.F.C. last Christmas. He returned to France last July. His machine was shot down in an air fight near the German lines on August 17th. All will wish that Sir Bryan and Lady Leighton may soon have further good news of their gallant son.

* * *

Re Lieut. I. B. Hart-Davies, deceased. Pursuant to the Law of Property Amendment Act, 1859 (22 and 23 Vict. c. 35), Notice is hereby given that all Creditors and persons having any claims or demands upon or against the estate of Ivan Beauclerk Hart-Davies, late of Rugby, in the County of Warwick, Insurance Broker, serving as Lieutenant in the Royal Flying Corps (who died on the 27th day of July, 1917, and whose Will was proved by Charles Henry Fuller, of Rugby, aforesaid, Solicitor, and Basil Bentham Dickinson, of Rugby School, Rugby, aforesaid, House Master, the Executors therein named on the 13th day of September, 1917, in the Principal Probate Registry), are hereby required to send in the particulars of their claims and demands to the undersigned Solicitors of the said Executors on or before the 8th day of October, 1917, and notice is hereby also given that after that day the said Executors will proceed to distribute the assets of the deceased among the parties entitled thereto, having regard only to the claims of which the said Executors shall then have notice, and that they will not be liable for the assets or any part thereof so distributed to any person of whose debt or claim they shall not then have had notice.

Dated this 17th day of September, 1917.

Fredk. Fuller & Son, Rugby.
Solicitors to the Executors of the said deceased.



(Reproduced from "Aerial Age," New York.
A Triple-engined Caproni Triplane Landing.

Mr. Warner Allen, writing from the French Front on September 24th, in the "Morning Post," says :—

A German Army Order of recent date, which has come into the possession of the French, provides a key not only to the new defensive tactics which the enemy is opposing to the Anglo-French offensive in Flanders, but to the reasons which have compelled him to resort to them. The Germans have found, says the Order, that the continuous lines constituting their front position are regularly and methodically destroyed by our artillery before an attack begins. Subterranean shelters, especially in the first and second lines, have simply proved to be traps enabling the Allies to swell their lists of prisoners. The power of defence in a defensive battle depends essentially on the precautions taken to conceal the machinery of battle from the enemy's view. This machinery—trenches, subterranean shelters, machine-gun centres, and batteries—if recorded by the photographs taken by the enemy from the air will certainly be destroyed by the enemy artillery.

"During the battle," says the Order, "all idea of having a continuous front trench line must be abandoned. This must be replaced by shell crater nests held by groups of men and isolated machine-guns, disposed like the squares on a chess-board."

Admittedly the object of all this is to enable the enemy to hide all trace of his presence from our airmen's cameras. His front is to show no sign of his existence. No eye must be able to distinguish it from No Man's Land. The thin, spidery lines across the aviators' photographs which show the lie of his trenches are to disappear. The camera in the air—the eye which guides the guns—is what the Hun has chiefly learned to fear during the summer campaign of 1917.

[Thus does an apparently insignificant accessory to aircraft change the tactics of armies. It indicates how vast a change might be brought about by the use of aeroplanes in adequate numbers and in other manners to which they are eminently suited.—Ed.]

* * *

Mr. Edmund Candler writing from Baghdad on Sept. 21st says :—

A novel use for aeroplanes was found the other day when two of our machines were the cause of the surrender of a small enemy detachment at Diwaniyeh, on the Euphrates.

The garrison had been left there in charge of sick and stores by the Turkish Euphrates force in the second week of March during their retirement from Samawa to Ramadieh at the time of our occupation of Baghdad. They held out for some months at Diwaniyeh in the hope that the Euphrates might be reoccupied by the Turks. At the end of July a number of the garrison surrendered to the townspeople, and were handed over to us, but a single officer and some 30 men refused to yield until the aeroplanes came and bombed the house in which they had taken refuge.

The lieutenant and his detachment formed a last batch of isolated Turks who have hung out in the remote districts between Nasiriyeh and our posts farther north on the Euphrates.

* * *

A military balloon passed over Brixton about 6 p.m. on Sept. 20th at a low altitude. It continued to descend, and eventually came to earth in some gardens off Croxted Road, Dulwich. The balloon carried no crew. This appears to have been the balloon from which a man fell in Richmond Park. When last seen in that neighbourhood another man was still sitting in the rigging, but there was no car.

FRANCE.

Official Communiqués.

Sept. 18th.—Yesterday five German aeroplanes were brought down in air fighting or by the fire of our machine-guns.

Sept. 21st.—During Sept 19th and 20th two German aeroplanes were brought down, and eight other enemy machines were obliged to land in a badly damaged condition.

Army of the Orient.—British aviators bombarded the enemy establishments to the north of Doiran.

Sept. 22nd.—Between September 10th and 20th, 15 German aeroplanes and a captive balloon were brought down by our pilots.

Twenty-nine German machines were driven down damaged within their own lines as the result of aerial fighting.

Army of the Orient.—British aeroplanes have bombarded enemy establishments in the neighbourhood of Demirhissar (Struma front).

Sept. 23rd.—During yesterday our chaser aeroplanes had numerous fights. Eleven German aeroplanes and one captive balloon were destroyed by our pilots.

During yesterday and during last night our aviators showered bombs on the munition depots of Donon (Vosges), the factories of Hagondange (north of Metz), and the railway stations of Chambley, Thionville, Luxembourg, Metz, Woippy, Maizières-les-Metz, etc. (in the Briey Basin).

In Belgium they bombarded the railway stations of Staden, Roulers, and Cortemarck.

Sept. 24th.—Enemy aeroplanes last night bombarded the region north of Bar le Duc. Several bombs fell on a group of German prisoners, two of whom were killed and 17 wounded. During the day of September 23rd our pilots brought down six German aeroplanes.

GERMANY.

Official Communiqués.

Sept. 18th.—Senior Lieut. Berthold again shot down two opponents in aerial battle.

Sept. 18th.—Our enemies undertook several bombing raids on September 16th against South German territory. Stuttgart, Tübingen, Freudenstadt, Oberndorf, Stingbert (?), Saarbrücken, and Colmar were attacked. Near Stuttgart one soldier was slightly wounded. At Freudenstadt and Colmar damage was done to buildings. None of the other attacks caused either losses in killed and wounded or material damage. Three of the enemy aeroplanes were shot down on German soil.

Sept. 19th.—Yesterday 16 enemy aeroplanes were shot down. Vice Sgt.-Major Thom shot down three opponents, and Lt. Thuy two.

Sept. 20th.—Twenty enemy aeroplanes were shot down. Vice-Sgt. Major Thom again brought down two opponents in aerial battle.

Sept. 22nd.—The aviators took a prominent part in the fighting in Flanders. During the last two days 39 enemy aeroplanes and two captive balloons have been shot down. Three of our aviators fell. Ober Lt. Schleich gained his 21st and 22nd aerial victories. Lt. von Bülow shot down his 21st opponent; Lt. Wüsthof and Lt. Adam both shot down two enemy aviators.

Sept. 23rd.—The enemy lost 14 aeroplanes yesterday and one captive balloon. Sgt. Thom again brought down two aviators in aerial battle.

Yesterday morning an English monitor, assisted by aerial observers, bombarded Ostend. A few shells struck the Cathedral, in which early Mass was being held. Several Belgians were killed and 24 seriously wounded. The monitor was driven off by the fire of our coastal batteries.

Sept. 24th.—Temp. Sub-Lieut. G. S. Boston promoted to temp. Lieut., R.N.V.R., with seniority Sept. 21st.

* * *

A Berlin telegram of Sept. 19th announces that Lt. Aviator Curt Wolff was killed on Sept 15th. He had won the order Pour le Mérite, and was latterly leader of air squadron No. 11, which was for a long period led by Cavalry Captain Baron von Richthofen.

Lt. Wolff was well to the fore among German aviators last May, when, on the 13th of that month, he was officially reported as having brought down his 30th enemy opponent. The last mention of Wolff is in the German report of July 7th, when he was credited with his 33rd victim.

RUSSIA.

Official Communiqués.

Sept. 18th.—Our pilot Komarovsky, while making a reconnaissance, was attacked by an enemy aeroplane, which he brought down in the region of Lokatchi (in the direction of Vladimir-Volynski).

Sept. 21st.—On September 19th on the South-Western and the Rumanian fronts there were several aerial engagements and our aviators brought down four machines in the German lines. In the region of Novo Selki our aviator Vassilevsky brought down an enemy machine and the occupants have been made prisoners.

In the region south-east of Kowel our aviators dropped a hundredweight of bombs on the enemy camps in the villages of Cheremockno and Jino.

Sept. 24th.—On September 21st, in the Kowel region, our aviators bombarded the enemy rear and stores at Jino, Melnica, and Nugel, dropping about a hundredweight of bombs. Several fires broke out.

West of Husiatyn, Lieut. Jachello brought down an enemy machine, which fell in the region of Chabarovka.

On September 20th, in the region of Kezdi-Vasarhely, the Roumanian aviator Capt. Mihaletti engaged an enemy machine and forced it down into the enemy lines.

In the region of the Lower Danube our hydroplanes successfully dropped 18 bombs on the enemy lines.

Sept. 24th.—In spite of the misty weather the activity of our aviators was very great.

We bombed the enemy hutments in the direction of Leke in return for the bombing by enemy aeroplanes of some of our cantonments.

* * *

A message from Petrograd, dated Sept. 16th, states that the Russian aviator Smolianinoff has just arrived at Odessa after a notable trans-Balkan flight, in the course of which he flew from the Russian town of Bolgrad to Salonika and back, and then on to Odessa. Setting out for Bolgrad, a small town north of the Danube, in Bessarabia, the aviator made a non-stop run to Salonika, where he visited the Russian camp, and then returned direct to Bolgrad, flying at an altitude of 3,000 metres (about 10,000 ft.), covering the distance of 460 miles in the record time

of eight hours (sic). On arrival at Bolgrad, Smolianioff took up a passenger and continued his journey safely to Odessa.

ITALY.

Official Communiqués.

Sept. 22nd.—Last night three of our airships carried out an offensive action on the enemy encampments in the Chiapovano valley (north-east of Gorizia), the station and hutments of Grahova (five miles east of S. Lucia Polmino) and the railway works north-east of Prosecco (Gulf of Trieste). The operation, rendered difficult by a sudden change in atmospheric conditions, which became decidedly adverse, and by the enemy's most intense and well-directed fire, was brilliantly executed, and the objectives were bombarded with four tons of high explosive bombs.

Sept. 23rd.—Last night one of our airships navigating in unfavourable atmospheric conditions returned to the Chiapovano valley and renewed the effective bombardment of the enemy encampments there.

Sept. 24th.—The railway line in the Bazza Valley (east of Tolmino) was yesterday the objective of our air forces. In the morning one of our bombardment squadrons well escorted arrived almost by surprise over the railway station of Grahovo [about five or six miles east-south-east of Tolmino] at a moment when intense railway movement was going on, and four tons of bombs were dropped there. In the night an airship by dropping numerous high-explosive bombs greatly damaged the establishments in the neighbourhood of Podmelec [midway between Tolmino and Grahovo]. At the same time another airship once again bombarded the numerous enemy troops in the Chiapovano Valley.

Two enemy machines brought down by our aviators fell in flames at Cotici (east of S. Martino del Carso) and east of Kal (Bainsizza Plateau).

AUSTRIA.

From Switzerland comes the news that the 31st Galician Infantry, which was being rushed up to reinforce the Austrian forces on the Carso, was almost completely wiped out by the train transporting it being bombed by a Caproni squadron, which, having derailed it, got in some good work.—T. S. H.

BELGIUM.

A report from Amsterdam, dated Sept. 18th, states that it is learned from the frontier that the Germans throughout Flanders are busily engaged in constructing new aerodromes or enlarging existing ones. Particularly large ones are being erected at St. Denis, Westrem, where the staff numbers 700 men.

The Allied aviators are continuing their raids with good results. During the last raid several military trains were hit, among them being a munition train, which exploded. There were many victims.

HOLLAND.

A German aeroplane landed on the morning of Sept. 19th near Breskens, in the province of Zeeland. The aviators were interned.

U.S.A.

According to the Washington correspondent of the "New York Herald" (Paris edition), Sept. 19th, some Italian aviators, who are now in the United States, are soon to attempt a flight over the Atlantic with Caproni machines. They are practising by means of long flights from Newport News to Washington, returning via New York.

[It is satisfactory to learn that Italy is so well equipped with aviators and aeroplanes, that she can undertake experiments of a purely sporting and scientific nature.—Ed.]

AVIATOR'S PRESENCE OF MIND.

From the "Japan Times," July 26th, 1917.

Lieuts. Matsuoka and Noguch had a singular experience on Monday in their making a practice flight to Tokorozawa. The two aviators, one of whom was Lieut. Matsuoka, a flying coacher, went up to the sky early that morning in an aeroplane, and when they came over the placed named Ushinuma, in the village of Matsui, Iruma-gun, a little distance from the aerodrome at Tokorozawa, the motor of the machine suddenly went wrong and the aeroplane dropped to the height of 400 metres from that of 600 in an instant, which greatly surprised Lieut. Matsuoka, who, then, however, with the happy presence of mind, started the gliding on air, until he succeeded in landing the aeroplane on the top of a certain huge tree below in the neighbourhood, thus saving the machine from a certain destruction.

PRESENTATION AEROPLANES.

A contribution of £1,000 towards the cost of the purchase of an aeroplane has been presented to the Government by the Oba of Benin, on behalf of the Native Administration of Benin in the Southern Provinces of Nigeria.

CHANGE OF TELEPHONIC NUMBER.

The Prodger-Isaac Aviation Company, of 166, Piccadilly, London, W.1, announce that, in order to facilitate the receipt and transmission of urgent telephone messages in connection with the experimental tests and official acceptance trials carried out by this firm on behalf of various aircraft manufacturers, they have installed an additional telephone line, which has necessitated a change of number. The new number is now Gerrard 278 (2 lines). The telegraphic address remains the same, i.e., "Aeromnia, Piccy, London."

TRADE CARDS.

The services of an engineer with extensive factory experience are available for a position of responsibility with an important firm. Has been intimately connected with the Aircraft Industry since 1910. Is capable of designing, producing and flying any type of machin Is a good organiser, and successful in handling men.e. Inquiries to Box X.Y.Z., "The Aeroplane," 166, Piccadilly.

MISCELLANEOUS ADVERTISEMENTS.

AIRCRAFT PARTS.

Hardwood for Aeroplanes.—Specially Selected air-dried timber as supplied to leading constructors in Britain and the Continent. Silver Spruce, Ash, Poplar; Hickory and Ash Skids Threeply; Thin Cedar and Mahogany for Floats; Walnut for Propellers.—William Malinson and Sons, Ltd., Hackney Road 'Phone, 3854 Central, 4770 Wall.

Tapes, Webs, Cords and Threads in all qualities, suitable for Aircraft Work. Delivery from stock.—John MacLennan and Co., 30, Newgate Street, London, E.C.1. (See Advertisement Page 845 and Buyers' Guide.)

Aeroplane Seats. We can give quick delivery of cane seats, A.G.S. 264 or other patterns, guaranteed pass inspection. Write us for anything required in cane work.—The Willowbrook Company, Leicester.

Aeroplane Parts.—Advertiser wishes to invest capital and take personal interest in a business manufacturing parts under Government contracts.—Particulars in confidence to Box No. 2051, THE AEROPLANE, 166, Piccadilly, W.1.

Wanted Sheet Metal Work in copper, brass and turned steel tanks and tubing.—Apply F. W. Hall, East Anglian Copper and Brass Works, Norwich.

TUITION.

THE POLYTECHNIC, 309, REGENT ST., LONDON, W.1.
The Special Evening Courses in
AERO-ENGINEERING
will commence on October 1st, 1917.
The Course comprises (i) Science of Flight, (ii) Aircraft Design, (iii) Aero-motors, (iv) Engineering Drawing, etc.
Full Syllabus can be obtained on application to Major Robert Mitchell, Director of Education.

A course of about twenty lectures, suitable for young engineers will be given by Mr. Campbell Houston, B.Sc., A.M.Inst.C.E., at the South-Western Polytechnic Institute, Manresa Road, Chelsea, on Tuesday evenings at 8 o'clock, commencing October 9th. Fee 10s. Engineering departments open for session on September 24th. Syllabus from Secretary (Room 45).

WANTED.

Machine Work.—Firm with well-equipped machine shops, now engaged on Munitions, solicits enquiries for all classes of turning, drilling, grinding, milling, fitting, etc. Small copper pipe work, also brazing in all metals a speciality.—Correspondence with a view to post-war business especially invited. The Lankester Engineering Co., 38, Eden Street, Kingston-on-Thames.

Wanted aircraft metal work of any description: immediate deliveries, accurate and high-class finish.—Write Box No. 2099, THE AEROPLANE, 166, Piccadilly, W.1.

Painting, Varnishing, Japanning or Enamelling of small articles undertaken for the trade; best finish in any colour on any material. Please state quantities to Box 3006, THE AEROPLANE, 166, Piccadilly, W.1.

Wanted woodwork for aeroplane parts by practical men not on Government work.—Apply Box No. 3002, THE AEROPLANE, 166, Piccadilly, W.1.

Sub-contractor is prepared to execute woodwork parts. (Works in London.)—Apply Box No. 3009, THE AEROPLANE, 166, Piccadilly, W.1.

Wanted.—Sub-contracts for wood parts and complete spares by competent firm. Highest class workmanship and prompt deliveries guaranteed.—Box No. 3007, THE AEROPLANE, 166, Piccadilly, W.1.

MODELS.

T. W. K. Clarke and Co., Ltd., Model Department, Hampton Wick.—Though we are full up with full-size aeroplane parts orders, we still build models as we did in 1906. Sop with Biplanes, etc., in Stock.—Send 3 stamps for our illustrated list, 120 items and 14 models; certain aluminium goods are out of stock.

Make a Modern Tractor Biplane for Sixpence.—Set of parts to make a paper model biplane, which is guaranteed to perform all the evolutions of its original: scientifically strengthened with ribs and bracings as in actual practice. Span 14 in. Send 6d. postal order now. The Model Aircraft Supply Co., 79, Rosebery Crescent, Newcastle-on-Tyne.

Teach your Boy the Mysteries of Flying. Model aeroplane. Flies ¼-mile, circular flight, 3s. 3d., carriage paid. Others, 4s. 6d., 7s. 3d., 10s., 21s., and 28s. Testimonials from all parts. Thousands satisfied. List, ½d. stamp. Dept. C, Bristol Model Aeroplane Depot, Eastville, Bristol.

Wanted—model aeroplanes—any style; also small propellers, cheap.—Gems Bros., Weybridge.

ENGINEERING.

British School of Aeronautics. — Aircraft Engineering Course; Aero Design; Aero Construction; Aero Draughtsmanship; Mechanical Engineering. — Pennington's, 254, Oxford Road, Manchester.

PUBLICATIONS.

Songs of the Submarine. By Klaxon. Now ready. Price, 2s. net. 2s. 3d., post free.

Ballads of the Flying Corps. By G. R. Samways, R.F.C. Price, 2s. 6d. net. 2s. 9d., post free.—McBride, Nast & Co., Ltd., 2, Breams Bldgs., E.C.4.

All Advertisements for the Miscellaneous Advertisement Columns MUST arrive at this office by first post on Saturday.

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Special PREPAID Rate: 18 words 1/6; Situations Wanted ONLY, 18 words 1/-; 1d. per word after.
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FINANCE.

Practical Aeroplane Manufacturer and Engineer, with many years' experience of aircraft design and construction, would like to meet Capitalist, Syndicate, or private gentlemen interested in military aviation or commercial aeronautics. Excellent proposition to put forward.—Apply Box No. 2050, The Aeroplane, 166, Piccadilly, W.1.

Engineer laying down works manufacture aeroplanes on large scale, open for partner, sleeping or active.—Address Box No. 3010, The Aeroplane, 166, Piccadilly, W.1.

PATENTS.

PAGE & ROWLINGSON, Chartered Patent Agents (Consulting Engineer, Mr. S. E. Page, A.M.Inst.C.E.), 27, Chancery Lane, London, W.C. Tel. 332 Central.

Henry Skerrett, Chartered Patent Agent, 24, Temple Row, Birmingham.—Patents, trade marks, and designs.

Inventors advised free. Write for booklet.—King's Patent Agency, Ltd., 165, Queen Victoria Street, London. 30 years' references. Stanley, Popplewell and Co., Patent Agents and Consulting Engineers. Applications for Patents attended to in all countries.—38, Chancery Lane, W.C. Telephone: 1763 Central. Circular free.

SITUATIONS VACANT.

Splicer required for steel cables (aeroplane erection). First-class workman essential. No one already engaged on Government work or resident more than 10 miles away will be engaged.—Apply personally or by letter to Works Manager, Handley Page, Ltd., Kingsbury Works, Edgware Road, Hendon, N.W.

Aeroplane Fitters wanted for assembling main planes and similar work; near London. Good wages to suitable men. No one residing more than 10 miles away or engaged on Government work need apply. Write stating age, experience, and wages required to Box 189, c/o Mitchell's Advertising Agency, 1, Snow Hill, E.C.1.

Aerodrome Engineer.—Experienced engineer wanted, capable of taking charge of aeroplanes and their engines from completion of erection until final acceptance. Must be tactful, steady, and willing to attend at all hours. N.W. District. No one resident more than 10 miles away or engaged on Government work need write 438, Sells, Ltd., Fleet St., E.C.4.

Wanted first-class practical engineer as works manager by important firm of aircraft constructors in London District employing over 2,000 hands. Must be good organiser, strict disciplinarian, energetic, keen and methodical, tactful and experienced in the control of male and female labour. No one residing more than ten miles away or at present employed on Government work need apply.—Write George Reader and Co., Solicitors, 35, Coleman Street, London, E.C.

Wanted Storekeeper or Assistant Buyer, experienced, for aeroplane works. No one residing more than ten miles away or engaged on Government work need apply. Write stating experience and salary required. Offer, Church Street, Kingston-on-Thames.

Aeroplane Erectors required immediately—good wages to experienced men. No one residing more than ten miles away or already engaged on Government work need apply.—Apply personally, Ilford Aeroplane Works, Ilford, E.

Man wanted to control staff in progress department of large aircraft works and to be responsible for distributing work in shops. Must have had similar experience with an up-to-date firm. 6 o'clock job. No one on Government work need apply.—Apply stating age, experience, and salary required to nearest Board of Trade Employment Exchange, mentioning this paper and Box No. 2097.

Works Manager, bolt and nut works; genuine experience, energetic, accurate, 6 o'clock man. Salary and bonus; London area. State experience and salary required. No one residing more than ten miles away or engaged on Government work need apply. Applications will be treated with the strictest confidence. Apply Box No. 3011, The Aeroplane, 166, Piccadilly, W.1.

Wanted at once—two good progress men—must be technical engineers. Those used to aircraft work preferred. One hour from London. Good salary and conditions.—Applications must be made through nearest Employment Exchange, mentioning this paper and Box No. 3013.

Tool Setter for capstan lathe and milling machine required. No one already engaged on Government work or residing more than ten miles away need apply.—Reply by letter to Canute Airplane Co., Ltd., Royal Pier Gates, Southampton.

Draughtsman wanted, mechanical or electrical. Particularly with experience of internal-combustion engines or aircraft. No one on Government work need apply.—Applicants must respond through the nearest Board of Trade Employment Exchange, stating age, experience and salary required, mentioning this paper and Box No. 2098.

Wanted for aircraft factory in Norfolk, competent assistant storekeeper. Previous experience in hardware trade essential, preferably with engineer's tools and supplies. Ineligible. No one on Government work need apply.—Apply nearest Employment Exchange, mentioning this paper and No. 1306.

Wanted by an old-established firm engaged on aircraft, a capable production engineer. Must have full knowledge of modern methods of production, jig work and press tools, be energetic and tactful. Must be 6 o'clock man. Give full details when replying, general statements will not receive consideration. No man engaged on Government work need apply.—Applications must be made through nearest Employment Exchange, mentioning this paper and Box No. 3008.

Wanted immediately, a good engineering draughtsman for urgent seaplane work. Previous experience desirable, but not essential. No man will be engaged without the consent of his present employer. Those resident more than ten miles away or already engaged on Government work need not apply.—The Fairey Aviation Co., Ltd., Hayes, Middlesex.

Wanted experienced storekeeper for aeroplane works near London. Good salary and prospects to the right man. Must be ineligible. No one residing more than ten miles distant or at present engaged on Government work need apply.—Write George Reader and Co., 35, Coleman Street, London, E.C.

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Practical Aeronautical Engineer with 7 years' experience of aeroplane and seaplane manufacture and of aviation in all its branches. Three years' shop experience; practical organiser; at present engaged as works manager of aviation firm. Is prepared to make a change in the event of a suitable offer being received; or would submit practical proposition to any firm or individual wishing to take up aeroplane manufacture.—Box No. 2092, The Aeroplane, 166, Piccadilly, W.1.

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